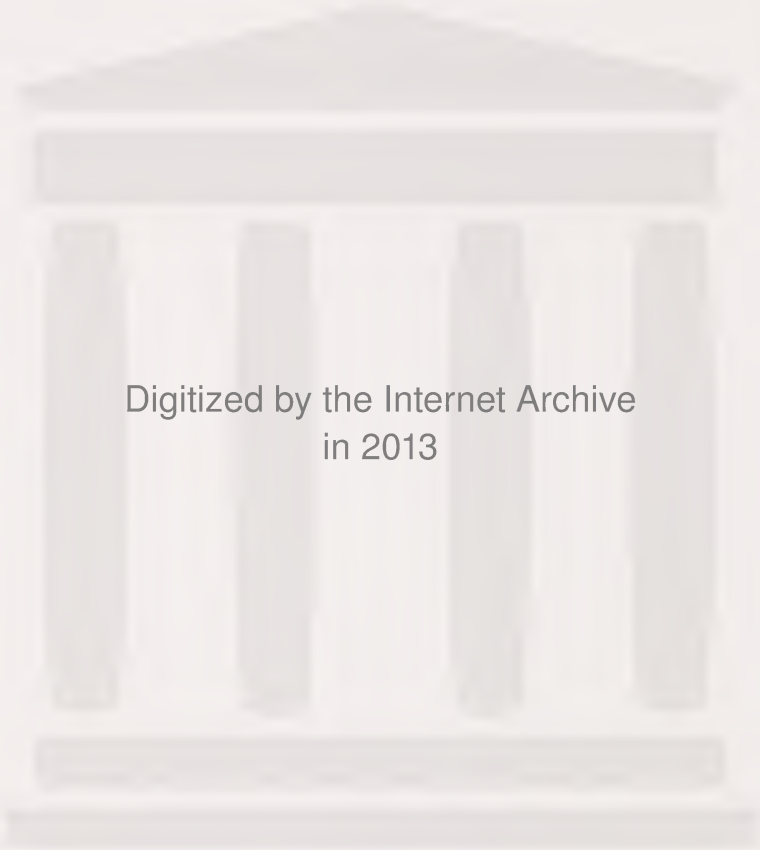
Clemson University

1993-94 Announcements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Clemson University
Undergraduate Announcements
1993-94

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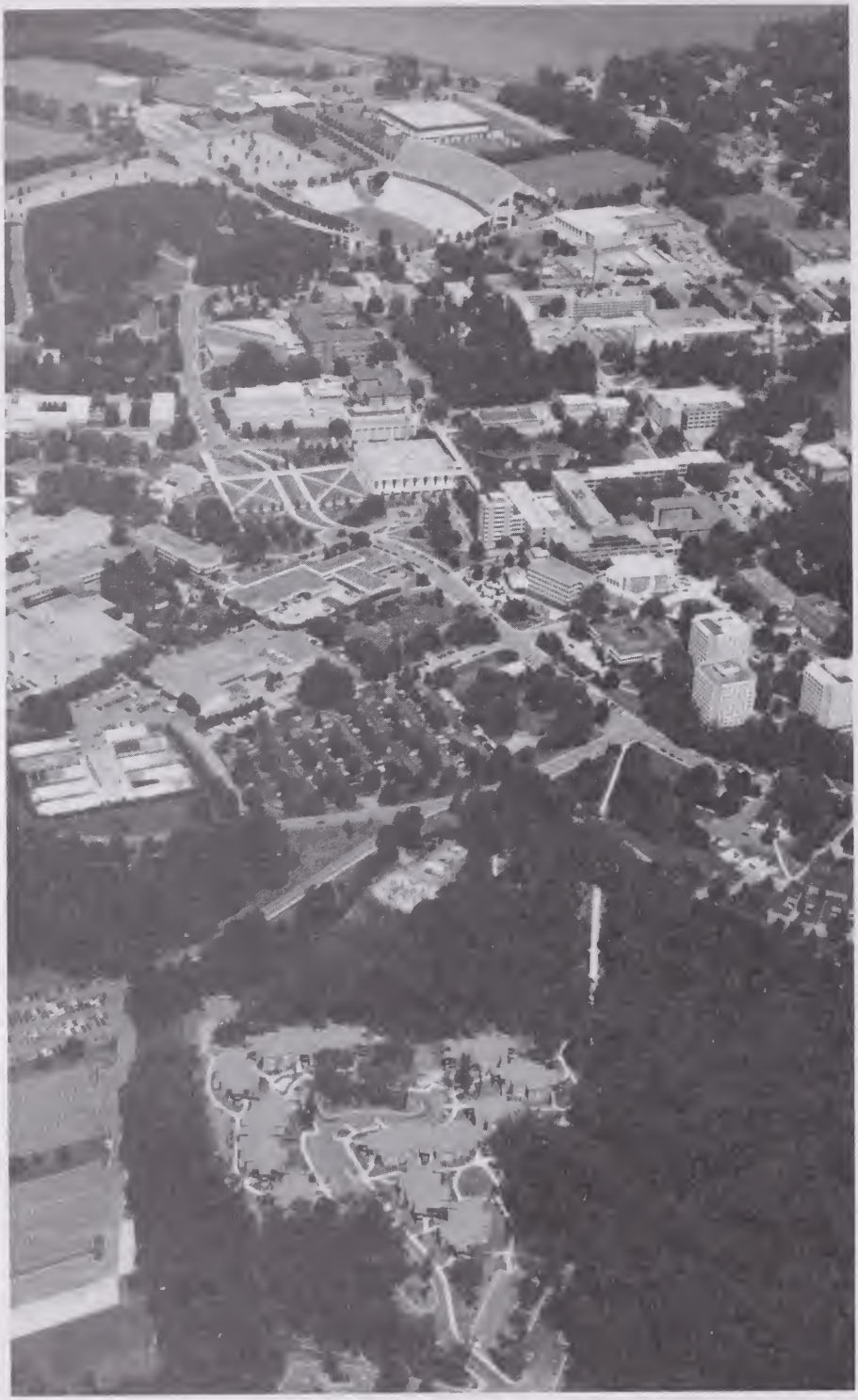

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Front cover photo: Martin Fox

Academic Calendar

FIRST SUMMER SESSION 1993

May 17, M	Walk-thru registration
May 18, Tu	Classes begin; late registration fee applies
May 19, W	Last day to register or add a class
May 26, W	Last day to drop a class or withdraw from the University without a W grade
June 7, M	Last day to order diploma for August graduation
June 9, W	Last day to drop a class or withdraw from the University without final grades
June 17, Th	On-line registration for Second Summer Session ends
June 22, Tu	Examinations

SECOND SUMMER SESSION 1993

June 28, M	Orientation
June 29, Tu	Walk thru-registration
June 30, W	Classes begin; late registration fee applies
July 1, Th	Last day to register or add a class
July 5, M	Holiday
July 9, F	Last day to drop a class or withdraw from the University without a W grade
July 10, S	Classes meet
July 22, Th	Last day to drop a class or withdraw from the University without final grades
July 29, Th	On-line registration for Fall Semester ends
August 4, W	Examinations
August 7, S	Graduation

FALL SEMESTER 1993

August 16, M	Orientation
August 17, Tu	Walk-thru registration
August 18, W	Late walk-thru registration
August 19, Th	Classes begin; late registration fee applies
August 25, W	Last day to register or add a class
September 8, W	Last day to order diploma for December graduation
September 15, W	Last day to drop a class or withdraw from the University without a W grade
October 18-19, M-Tu	Fall break
October 27, W	Last day to drop a class or withdraw from the University without final grades
November 3, W	On-line registration begins
November 25-26, Th-F	Thanksgiving holiday
December 1-2, W-Th	Classes meet; exams permitted in labs only
December 3, F	Reading Day (no classes; lab exams only)
December 6-11, M-S	Examinations
December 9, Th	On-line registration for Spring Semester ends
December 16, Th	Graduation

SPRING SEMESTER 1994

January 10, M	Walk-thru registration; orientation
January 11, Tu	Late walk-thru registration
January 12, W	Classes begin; late registration fee applies
January 18, Tu	Last day to register or add a class
February 1, Tu	Last day to order diploma for May commencement
February 8, Tu	Last day to drop a class or withdraw from the University without a W grade
March 18, F	Last day to drop a class or withdraw from the University without final grades
March 21-25, M-F	Spring break
April 2-9, S-S	Honors and Awards Week
April 6, W	On-line registration for Summer Sessions and Fall Semester begins
April 27-28, W-Th	Classes meet; exams permitted in labs only
April 29, F	Reading Day (no classes; lab exams only)
May 2-7, M-S	Examinations
May 12, Th	On-line registration for First Summer Session ends
May 13, F	Commencement

FIRST SUMMER SESSION 1994

May 23, M	Walk-thru registration
May 24, Tu	Classes begin; late registration fee applies
May 25, W	Last day to register or add a class
June 1, W	Last day to drop a class or withdraw from the University without a W grade
June 13, M	Last day to order diploma for August graduation
June 15, W	Last day to drop a class or withdraw from the University without final grades
June 23, Th	On-line registration for Second Summer Session ends
June 28, Tu	Examinations

SECOND SUMMER SESSION 1994

July 4, M	Holiday
July 5, Tu	Orientation
July 6, W	Walk-thru registration
July 7, Th	Classes begin; late registration fee applies
July 8, F	Last day to register or add a class
July 9, S	Classes meet
July 14, Th	Last day to drop a class or withdraw from the University without a W grade
July 28, Th	Last day to drop a class or withdraw from the University without final grades
August 4, Th	On-line registration for Fall Semester ends
August 10, W	Examinations
August 13, S	Graduation

FALL SEMESTER 1994

August 22, M	Orientation
August 23, Tu	Walk-thru registration
August 24, W	Late walk-thru registration
August 25, Th	Classes begin; late registration fee applies
August 31, W	Last day to register or add a class
September 14, W	Last day to order diploma for December graduation
September 21, W	Last day to drop a class or withdraw from the University without a W grade
October 31, M	Last day to drop a class or withdraw from the University without final grades
November 2, W	On-line registration begins
November 7-8, M-Tu	Fall break
November 24-25, Th-F	Thanksgiving holiday
December 7-8, W-Th	Classes meet; exams permitted in labs only
December 9, F	Reading Day (no classes; lab exams only)
December 12-17, M-S	Examinations
December 22, Th	Graduation

SPRING SEMESTER 1995

January 9, M	Walk-thru registration; orientation
January 10, Tu	Late walk-thru registration
January 11, W	Classes begin; late registration fee applies
January 17, Tu	Last day to register or add a class
January 31, Tu	Last day to order diploma for May commencement
February 7, Tu	Last day to drop a class or withdraw from the University without a W grade
March 17, F	Last day to drop a class or withdraw from the University without final grades
March 20-24, M-F	Spring break
April 1-8, S-S	Honors and Awards Week
April 5, W	On-line registration for Summer Sessions and Fall Semester begins
April 26-27, W-Th	Classes meet; exams permitted in labs only
April 28, F	Reading Day (no classes; lab exams only)
May 1-6, M-S	Examinations
May 12, F	Commencement

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General Information

HISTORY

When one man of wisdom and foresight can look among the despair of troubled times and imagine what could be, great things can happen. That's what the University's namesake, Thomas Green Clemson, was able to do in the post-Civil War days.

He looked upon a South that lay in economic ruin, once remarking that "conditions are wretched in the extreme" and that "people are quitting the land." Still, among the ashes he saw hope.

Mr. Clemson envisioned what could be possible if the South's youth were given an opportunity to receive instruction in scientific agriculture and the mechanical arts.

He once wrote, "The only hope we have for the advancement of agriculture (in the U.S.) is through the sciences, and yet there is not one single institution on this continent where a proper scientific education can be obtained." When he was president of the Pendleton Farmers Society in 1866, Mr. Clemson served on a committee whose purpose was to promote the idea of founding an institution for "educating the people in the sciences" and "which will in time secure permanent prosperity."

When he died on April 6, 1888, it set in motion a series of events which marked the start of a new era in higher education in the state of South Carolina, especially in the study of science, agriculture, and engineering.

Mr. Clemson's passing set the stage for the founding of the university which bears his name—the beginning of a true "people's university" which opened the doors of higher education to all South Carolinians, rich and poor alike.

In his will, Mr. Clemson bequeathed the Fort Hill plantation and a considerable sum from his personal assets for the establishment of an educational institution of the kind he envisioned. He left a cash endowment of approximately $80,000 as well as the 814-acre Fort Hill estate, to South Carolina for such a college. The biggest obstacle in the creation of an agricultural college—the initial expense—was removed by Mr. Clemson's bequest.

In November 1889, Governor Richardson signed the bill accepting Thomas Clemson's gift. Soon after, a measure was introduced to establish the Clemson Agricultural College, with its trustees becoming custodians of Morrill Act and Hatch Act funds made available for agricultural education and research purposes by federal legislative acts.

The founding of Clemson Agricultural College supplanted the South Carolina College of Agriculture and Mechanics, which had opened in Columbia in 1880.

Today, more than a century later, the University is much more than its founder ever could have imagined or hoped for. With its diverse learning and research facilities, the University provides an educational opportunity not only for the people of the State, as Mr. Clemson dreamed, but for

thousands of young men and women throughout the country and the world.

This confirmed bachelor came to the foothills of South Carolina when he married Anna Maria Calhoun, daughter of South Carolina's famous statesman John C. Calhoun.

Born in Philadelphia, Mr. Clemson was educated at schools both in the United States and France, where he attended lectures at the Royal School of Mines, studied with prominent scientists in the private laboratories of the Sorbonne Royal College of France, and received his diploma as an assayer from the Royal Mint in Paris.

Mr. Clemson, then in his mid-20s, returned to America greatly influenced by his European studies. He became a great advocate of the natural sciences, achieving a considerable reputation as a mining engineer and a theorist in agricultural chemistry. He also was a gifted writer whose articles were published in the leading scientific journals of his day, an artist and a diplomat who represented the U.S. government as chargé d'affaires to Belgium for almost seven years.

Mr. Clemson had a lifelong interest in farming and agricultural affairs. He served as the nation's first superintendent of agricultural affairs (predecessor to the present secretary of agriculture position) and actively promoted the establishment and endowment of the Maryland Agricultural College in the 1850s.

Although he is remembered today for these accomplishments, Thomas Clemson made his greatest historical contribution when, as a champion of formal scientific education, his life became intertwined with the destiny of educational and economic development in South Carolina. Although he never lived to see it, his dedicated efforts culminated in the founding of Clemson Agricultural College.

At the time of his death, Mr. Clemson was living at the Fort Hill homeplace (the John C. Calhoun Mansion), which today is a National Historic Landmark and provides a historic centerpiece for the Clemson University campus. He had inherited the house and plantation lands of his famous father-in-law, Senator Calhoun, upon the death of Mrs. Clemson in 1875.

Clemson College formally opened in July 1893, with an enrollment of 446. From the beginning, the college was an all-male military school. It remained this way until 1955, when the change was made to "civilian" status for students and Clemson became a coeducational institution. In 1964, the college was renamed Clemson University as the state legislature formally recognized the school's expanded academic offerings and research pursuits.

On November 27, 1989, the University observed the 100th anniversity of the State's acceptance of the terms and conditions of Mr. Clemson's bequest.

THE CAMPUS

The University campus, located on the former homestead of statesman John C. Calhoun, consists of approximately 1,400 acres. Located in the foothills of the Blue Ridge Mountains, the campus has an elevation of 800 feet above sea level and commands an excellent view of the mountains to the north and west, some of which attain an altitude of over 5000 feet.

The Southern Railway and U. S. Highways 76 and 123 provide easy access to the city of Clemson and to the University.

Campus architecture is a pleasing blend of traditional and modern facili-

ties enhanced by a beautiful landscape of towering trees, grassy expanses, and flowering plants and shrubs. Present academic and administrative buildings and contents on campus represent an insured value of $627 million. Over 32,000 acres of forestry and agricultural lands, devoted to research, public service, and 4-H activities throughout the state are part of Clemson University's real estate holdings. Fort Hill, the former home of John C. Calhoun inherited by Thomas Clemson, and the Hanover House (located on East Campus), are listed on the National Register of Historical Places and are open to the public.

The Robert Muldrow Cooper Library and its reflection pond are a dominant feature of the main campus. The library houses over 1,500,000 books, microforms, periodicals, and other research materials. The nearby outdoor theater provides a centrally located meeting place for University students and alumni.

The Strom Thurmond Institute, located south of the library, was dedicated on April 22, 1989. This building houses institute offices, Senator Thurmond's offices, papers, and memorabilia, and special collections once exhibited in Cooper Library. The Institute is part of an instructional and public-service center that includes the Brooks Center for Performing Arts and a proposed Continuing Education/Conference Center.

Several campus facilities support the departments of the College of Engineering. Riggs Hall currently houses Electrical and Computer Engineering and Mechanical Engineering; Rhodes Engineering Research Center—Bioengineering and Environmental Systems Engineering; Olin Hall—Ceramic Engineering; Earle Hall—Chemical Engineering; Freeman Hall—Industrial Engineering; Lowry Hall—Civil Engineering; and McAdams Hall—Agricultural and Biological Engineering, jointly administered by the Colleges of Engineering and Agricultural Sciences. A new academic facility of approximately 100,000 gross square feet is in the design phase. When completed, the Engineering Innovation Center will house Electrical and Computer Engineering and Mechanical Engineering.

The Division of Agriculture and Natural Sciences has teaching and research facilities in Barre Hall, Lehotsky Hall, Long Hall, McAdams Hall, Newman Hall, the Poole Agricultural Center, and the new, sophisticated Toxicology Research Laboratory. Clemson University sells its famous bleu cheese, ice cream, and other prime agricultural products to the public at the Agricultural Sales Center in Newman Hall. The new T. Ed Garrison Show-and-Sell Arena houses livestock sales, shows, and rodeos. The facility seats approximately 5,000 spectators.

The College of Forest and Recreation Resources manages forestry research lands in Oconee, Pickens, and Anderson Counties. The Outdoor Laboratory, bordering Lake Hartwell, has cabins, recreational buildings, a central lodge and open-air facilities. This laboratory provides an invaluable teaching and research tool for the Department of Parks, Recreation, and Tourism Management. The South Carolina Botanical Garden, located on East Campus, is an excellent teaching and research resource and a pleasurable location to enjoy the beauty of the piedmont region of South Carolina.

Long Hall, Jordan Hall, Kinard Laboratory, Martin Hall, and Hunter Laboratory for Chemistry contain the teaching and laboratory facilities of the College of Sciences.

The College of Nursing Center, built in 1978, is between Strode Tower and Schilletter Dining Hall. Redfern Health Center, a student health service and infirmary, contains eleven beds and also serves as an out-patient clinic.

Lee Hall houses the College of Architecture. The College of Liberal Arts, housed in Strode Tower, has classrooms and laboratories located in Daniel Hall, historical Hardin Hall, Martin Hall, and Brackett Hall. The Brackett Hall renovation (under construction) will provide expanded academic and administrative space for the College of Liberal Arts.

The College of Commerce and Industry continues its rapid growth. Sirrine Hall and the Clemson Apparel Research Facility contain the college's academic, administrative, and research space. Historical Tillman Hall houses the College of Education and the Clemson University Visitors Center.

Fike Recreation Center contains handball and basketball courts, a swimming pool and diving tank, and multipurpose rooms that support a variety of student programs. Outdoor and indoor tennis courts on West Campus, intramural fields and a golf practice range also provide students, faculty, and staff access to recreational facilities.

CLEMSON UNIVERSITY MISSIONS STATEMENT

Clemson University is the scientifically oriented institution of higher education established by the citizens of South Carolina to preserve, enhance, interpret, and disseminate the body of human knowledge. As a publicly assisted, comprehensive land-grant institution, Clemson serves the State, the nation as a whole, and the international community through teaching, research, and public service activities.

The original philosophy guiding the University's mission appeared in the enabling legislation of the Morrill Land Grant Act of 1862, the will of Thomas Green Clemson which calls for the establishment of a "high seminary of learning," and the Act of Acceptance by the General Assembly of the State of South Carolina. Subsequent broadening of the general mission occurred with the passage by Congress of the Hatch Act of 1887, the Smith-Lever Act of 1914, and National Sea Grant Act of 1966. Further refinements are elaborated in the South Carolina Master Plan for Higher Education set forth in 1979 by the South Carolina Commission on Higher Education and through the focus of the Second Century Plan initiated by the University in 1986.

To fulfill its historic, expanded, and evolving mission, Clemson offers undergraduate and graduate programs within nine colleges and a graduate school to a diversified on-campus student body and to a variety of audiences through continuing education courses on and off campus. The institution's role within the State of South Carolina is fulfilled through its mandated thrusts in agriculture and natural resources, architecture, engineering, textiles, basic sciences and technologies, and through an expanded role which also addresses the State's cultural and economic needs through emphases in health sciences, business, education, and the liberal arts. Clemson University's response to public service is dynamic and unique. It is reflected through the expertise of each of its colleges, the S. C. Experiment Station, the Clemson University Cooperative Extension Service, and numerous regulatory programs which provide technical assistance, continuing education, technology transfer, and extension activities commensurate with life in a changing world and a global society.

The fulfillment of Clemson's mission rests, in large measure, with its faculty, who, individually, collectively, and in cooperation with all University personnel gather, interpret, and disseminate knowledge; generate new knowledge independently and in conjunction with colleagues and students; stimulate creative thought and expression; foster speculative and critical thought; groom leaders; initiate progressive change; prepare students to cope with the world as it is, contribute to developing a better world, and appreciate the interconnectedness of modern life; and advance the common good by anticipating and devising new solutions for intellectual, scientific, social, and technical problems.

As stewards to taxpayers, alumni, donors, and students, Clemson University will husband its resources; engage in strategic planning; implement, direct, and review authorized programs, modifying goals and operations as deemed necessary; and assess student, faculty, and administrative performance regularly and in accordance with norms upheld by both the University's evaluative procedures and those of appropriate professional societies.

ACCREDITATION

Clemson University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award the Bachelor's, Master's, Specialist, and Doctor's degrees. Curricula are accredited by Accreditation Board for Engineering and Technology, American Assembly of Collegiate Schools of Business, Computing Sciences Accreditation Board, Council on Accreditations of the National Recreation and Park Association, National Architectural Accrediting Board, National Association of State Directors of Teacher Education and Certification, National Council for Accreditation of Teacher Education, National League for Nursing, and Society of American Foresters. Documentation of accreditation may be reviewed in the college deans' offices.

LIBRARIES

Current resources and facilities of Clemson's libraries make Clemson one of the most important research institutions in the Southeast. Today, the libraries have a collection of over one and a half million items. Outstanding collections of journals, books, and primary research materials have been developed in many areas, especially agriculture, natural and physical sciences, economics and technology. In the social sciences, particularly strong manuscript collections have been developed around the papers of Vice President John C. Calhoun, South Carolina Governor James F. Byrnes, and Senator Edgar A. Brown. These and other resources are drawn on by scholars from all over the United States, Japan, and Europe. The library holds the papers of South Carolina Senator Strom Thurmond, many of which are available for research.

Extensive use of the collection is made by borrowers from many parts of the Southeast through modern, efficient techniques. The libraries have a computerized catalog and circulation system called LUIS. This makes the collections available for searching by terminals inside and outside the library and also provides accurate circulation control. The University libraries are linked by other computer terminals to more than 6,000 libraries through OCLC, Inc., for cataloging and inter-library loan services. Online bibliographic retrieval is available through DORIS, with more than 15 databases

mounted locally. In addition, the powerful database searching capabilities of BRS, Lockheed and SDC search services are available through do-it-yourself search and mediated searches. A remote center with terminals accessing the Clemson mainframe computer is available in the library as well as a microcomputer laboratory.

In addition to the Robert M. Cooper Library, the University libraries consist of Emery A. Gunnin Architectural Library in Lee Hall; Special Collections Unit, holding rare books, manuscripts and University archives, located in the Strom Thurmond Institute building.

Except for adjustments in scheduling during holiday periods, Cooper Library is open Monday-Thursday, 7:45 a.m.-1:00 a.m.; Friday, 7:45 a.m.-8:00 p.m.; Saturday, 10:00 a.m.-6:00 p.m.; and Sunday, 12:00 noon-1:00 a.m. Library policy requires that all students must present valid I.D. cards to check out library materials. New students are encouraged to visit with staff at the reference desk at any time to receive assistance with learning about the Library and to ask questions about collections, services, and policies.

COMPUTING FACILITIES

The Clemson University Division of Computing and Information Technology (DCIT) supports student coursework, research, and administrative data processing requirements of the University using a sophisticated network of computers. These include an HDS AS/EX-80 mainframe computer, several VAX computers, ranging in size from the Micro VAX II to VAX 8820, and numerous microcomputers. Computer centers are maintained in the Poole Agricultural Center and in the Information Technology Center at the Clemson Research Park. Remote sites containing a variety of computers, terminals, and peripheral equipment are maintained in Brackett, Cooper Library, Daniel, Hunter, Kinard, Lee, Lowry, McAdams, Martin, Poole, and Sirrine. Dial-up telephone numbers are available for local as well as national and international network access. Clemson is connected to the Internet via SURnet, which provides access to the national super-computer centers as well as other network resources. DCIT performs research, development, and public service projects through its Information Systems Development group.

STUDY AND WORK ABROAD PROGRAMS

Clemson University provides a number of opportunities for students to gain a global perspective, increase their knowledge of other countries and languages, and develop cross-cultural sensitivities.

International Student Exchange Program (ISEP) allows an undergraduate student to register, pay tuition, fees, and room and board at Clemson University and to enroll for a semester or year at one of more than one hundred universities worldwide. As an ISEP participant, one enrolls as a regular student at the host institution, takes the same courses, and participates in the same activities as regularly enrolled students at the foreign institution. Transfer credit is available upon approval. Application deadlines are normally in February.

Clemson University colleges that participate in studies abroad include Commerce and Industry, Engineering, and Liberal Arts. The College of Architecture offers a program in Italy for Architecture majors. In addition,

there are a variety of excellent opportunities for study abroad under the sponsorship of other United States colleges and international organizations.

For more information about the programs above, contact the study-abroad adviser or any of the colleges above. Students interested in working abroad should contact the Cooperative Education Office, 321 Brackett Hall.

COOPERATIVE EDUCATION

The Cooperative Education Program is a planned program in which students at the University combine alternate periods of academic study and periods of related work with a participating business, industry, agency, or organization. The work periods normally take place during the sophomore and junior years (including summers), while the freshman and senior years are spent in full-time study.

Students qualify for participation in the Cooperative Education Program by satisfactory completion of thirty semester hours of academic work. Transfer students may qualify in one semester. Three, four, or five co-op work periods are projected and included in each student referral. Usually two students from the same academic area are paired to fill a full-time work position with a participating employer. While one student is at work, the other is enrolled in classroom study at the University.

Students enrolled in the Cooperative Education program pay a registration fee of $15 each semester or summer session which coincides with their work period. That fee enables students to maintain student status and participate in student activities and services that are normally associated with being enrolled at the University. However, the fee does not cover the cost of tuition for academic courses, health service, or any of the other benefits normally associated with the standard University fee. In responding to insurance, tax, loans, and other questionnaires about status, the University classifies a student on work assignment to be a full-time continuing student. The work assignment is considered an integral part of the student's education, but no academic credit is awarded for this experience.

The Cooperative Education Program is offered to students enrolled in academic departments or programs in the Colleges of Agricultural Sciences, Architecture, Commerce and Industry, Education, Engineering, Forest and Recreation Resources, Liberal Arts, and Sciences.

SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION

The mission of the South Carolina Agricultural Experiment Station (SCAES) is to develop knowledge through research that will provide the database of information which South Carolina's citizens require to make intelligent decisions on matters concerning agriculture, natural resources, and the rural environment.[1] Over the years, Experiment Station scientists have made significant contributions to agriculture, from the development of an effective fowl cholera vaccine to the development of commercially

[1]With the counsel of its recently organized Advisory Board, three distinct thrust areas—Agricultural productivity, quality rural environment, and agribusiness development, and three measurable success criteria—knowledge development and utilization, professional development, and public trust enhancement—have been identified for the SCAES.

successful crop varieties. They work in new scientific areas such as packaging, ornamental horticulture, aquaculture, genetic engineering, and biotechnology.

The SCAES began in 1886 when the State's General Assembly established the Agricultural Farms and Station at the University of South Carolina in Columbia. In 1889, this research facility was renamed the South Carolina Agricultural Experiment Station and was moved to the Clemson Agricultural College. The SCAES now funds scientists and research projects in numerous departments and colleges throughout Clemson University. In addition, four research and education facilities are located in Blackville, Florence, Charleston, and Columbia.

The SCAES's annual budget of approximately $25 million finances the efforts of about 127 research scientists (FTE) and 241 support personnel (FTE). Nearly 12,000 acres are involved in research activities.

CLEMSON UNIVERSITY FOUNDATION

The Clemson University Foundation is a nonprofit organization which solicits, manages, and administers gifts from private sources for academic programs at Clemson University.

Originally chartered in 1933, it was restructured in 1987 to more effectively serve the overall Institutional Advancement program at the University.

There are 30 voting members of the Board of Directors who oversee the Foundation's activities. At least 16 of the 24 elected Directors are alumni of the University. Other voting directors include the past president of the Clemson University Foundation, the President and President Elect of the Clemson Univeristy Alumni Association, President and Vice President of IPTAY and the President of the Clemson Architectural Foundation. The President of Clemson University, the Vice President for Institutional Advancement, the Associate Vice President for Development, the Assistant Vice President for Development, the Director of Gift and Asset Management, the Vice President for Business and Finance, the Chairperson of the Trustee Committee on Institutional Advancement from the Clemson University Board of Trustees, the Provost and Vice President for Academic Affairs, and a representative from the Council of Academic Deans serve as ex officio directors. The Vice President for Institutional Advancement serves as the executive officer for the Foundation.

The Foundation operates with a heavy emphasis on an effective committee structure which reports through an executive committee to the full board. The Foundation's administrative division directs its attention to real estate, investments, policy and by-laws, and nominations. A fund-raising group, referred to as the Primary Gifts Committee, oversees the responsibility for planned gifts, major gifts, and corporate and foundation solicitation.

The market value of the endowment pool of the Foundation as of June 1992 was approximately $51 million.

CLEMSON ALUMNI ASSOCIATION

The Clemson Alumni Association has been recognized on numerous occasions over its history as one of the top such organizations in the country. The

mission of the Alumni Association includes three primary actions: serving, involving, and informing. The Association stresses service to its 65,000-plus alumni and to a student body of 16,000. Regular programs designed to strengthen the high loyalty and great interest that alumni have in their Alma Mater are conducted both on and off campus. Some 80 Clemson Clubs are located throughout the United States, and Clemson graduates are located in every state and most foreign countries throughout the world. Reunions, student alumni programs, and continuing education programs also form the basis for a varied array of services to benefit Clemson and Clemson alumni.

All functions and services of the National Clemson Alumni Association are coordinated out of offices located in the Clemson Alumni Center, a campus focal point that was built, furnished, and equipped entirely by gifts from alumni, especially for that purpose. Accurate records of addresses, employment, and biographical information are kept on alumni of the Institution as well as on thousands of former students who express a desire to be involved with the University and its alumni program.

A regular publication program keeps active alumni, friends, and parents aware of what Clemson is doing through its outstanding programs in teaching, research, and public service. *The Clemson World* magazine is published quarterly and the *Clemson World News* tabloid is also published quarterly.

Traditional programs such as the Alumni Distinguished Service Awards, Professorships, R. F. Poole, Frank Jervey, and Alumni Presidential Scholars; and awards for distinguished teaching, outstanding research, and high public service are recognized as the most prestigious of their kind on campus. Alumni are continually involved in developing new sources of enhancement for the educational programs of the University.

RESERVE OFFICERS TRAINING CORPS

The Departments of the Army and the Air Force both maintain ROTC units at Clemson University. Their mission is to produce officers of high quality to pursue both technical and nontechnical careers in the U.S. Army and Air Force. Both two- and four-year programs are available. The four-year program consists of the basic course for freshmen and sophomores and the advanced course for juniors and seniors.

Scholarships are available to selected ROTC students. Each scholarship pays for tuition, books, and laboratory expenses, in addition to $100 per month during the school year. Nonscholarship advanced cadets also receive $100 per month. Basic course credit may be awarded to students having one or more years of military service.

Selected advanced Air Force cadets receive flight training at government expense.

Cadets who complete the Advanced or Professional Course and satisfy commissioning requirements as established by law and/or regulations are appointed Second Lieutenants. Ample opportunity exists for graduate study in both services, with temporary deferments possible.

Admission

Admission to the University is competitive and is based primarily upon high school curriculum, grades, class standing, and Scholastic Aptitude Test (SAT) or American College Testing Program (ACT) scores. An applicant's intended major and state residency also receive consideration. To apply for admission candidates must submit a high school transcript through their counselor and have results of the SAT or ACT sent directly from the testing agency. In addition, all South Carolina public senior colleges and universities require that applicants for freshman admission complete the following courses in high school:

English Four credits are required, including at least two having strong grammar and composition components, at least one in English literature, and at least one in American literature. Completion of college preparatory English I, II, III, and IV will meet these requirements.

Social Studies Three credits are required, including one unit of American history. One-half unit of government and one-half unit of economics are also strongly recommended.

Mathematics Three credits are required, including Algebra I and II. Geometry is strongly recommended as the required third unit. A fourth unit is recommended but not required.

Laboratory Science Two credits are required, including at least one unit each of two laboratory sciences chosen from biology, chemistry, or physics. A third unit of a laboratory science is strongly recommended.

Foreign Language Two credits from the same foreign language are required.

PE/ROTC One credit in either physical education or ROTC is required.

Other One credit is required in advanced mathematics or computer science or a combination of these; or one unit of world history, world geography, or Western Civilization.

The SAT or ACT examination scores, rank in class, academic preparation, and recommendation of the high school counselor will be weighed carefully in the decision-making process. The applicant's acceptance will be confirmed upon presentation of a final high school transcript indicating continued academic progress and graduation.

Appeals Any freshman or transfer candidate who is denied admission may appeal for reconsideration provided the student: (1) presents new information, such as improved grades and/or class rank, improved SAT or ACT scores, or College Board Achievement Test scores; and (2) submits a letter outlining their rationale for the appeal. All appeals will be reviewed by the Office of Admissions. In some instances, appeals will be referred to the Admissions Exceptions Committee.

Admissions Exceptions If it is not possible to make a positive decision on the basis of previous academic performance and SAT or ACT scores, other factors such as special talents or high school profile may be considered.

Where appropriate, the Office of Admissions will refer such cases to the Admissions Exceptions Committee.

Transfer Admission All transfer applicants must have original transcripts of their records sent to Clemson directly from each college or university attended. Unless so stated on the transcript, the candidate should present statements of honorable dismissal and of eligibility to return to the institution last attended. To be considered for admission, candidates should have 30 semester (45 quarter) hours of work with a cumulative average of C+ (2.5 on a 4.0 scale). In addition, candidates should have completed all freshman courses in English, mathematics, and science for their intended major.

SAT scores are required of some transfer students, and high school transcripts may be required in a few instances. Candidates concerned will be notified individually if either or both of these credentials are needed.

Special Student Status The special student classification is designed for high school graduates or persons at least 19 years of age who have no interest in pursuing a degree. It is not a "trial admission" status or one for candidates who apply too late to submit credentials for consideration for regular admission. Applicants denied regular admission to Clemson are not eligible to apply as special students.

None of the usual credentials supporting an application are required of such applicants. A maximum of 18 undergraduate credit hours can be taken during the regular semester or summer sessions. Although it is possible to enroll in immediately succeeding semesters until the cumulative maximum of 18 credit hours is taken, students must submit a new application for each entrance period. Moreover, preregistration is prohibited, inasmuch as regular Clemson students have priority for enrollment in all courses.

Application Forms and Dates Application forms may be obtained by writing to the Office of Admissions, Clemson University, Clemson, South Carolina 29634-5124. Application forms and catalogs for all 1994 entry dates are available beginning September 1993. Preliminary application forms are available anytime for those who wish to be included in the September mailing, and freshman candidates are especially encouraged to submit preliminary applications and sit for the SAT or ACT during the spring semester of their junior year.

While there is no deadline for submitting an application, candidates should understand that admission is closed when all classroom space has been committed. The majority of freshman admission decisions are reached during the period November through March. Transfer students seeking entrance in August usually are notified between February and July. Candidates must submit a nonrefundable fee of $35 with their applications. This fee is not applicable toward tuition and/or other University fees.

Admissions Deposit With the exception of certain University scholarship recipients, all accepted candidates are required to submit a $100 admissions deposit. This deposit is applicable toward tuition and other University fees.

Housing All freshmen entering in 1993 will be offered on-campus housing. New transfer students entering Clemson in 1993 will be offered University housing if space is available.

Entrance Examinations All freshman candidates and some transfer stu-

dents must submit scores for either the Scholastic Aptitude Test (SAT) or the American College Testing Program (ACT). In most cases, students transferring from accredited colleges need not submit SAT or ACT scores if they have earned thirty or more transferable semester hours with a C+ or greater average, based on a four-point grading system. Those enrolled in technical programs at technical and community colleges usually will be required to submit SAT or ACT scores. (Beginning in the spring 1994, the SAT will be known as SAT I: Reasoning Tests.)

For August enrollment, it is recommended that students complete the SAT or ACT no later than the preceding December. Candidates who have completed the required tests previously may have their scores reported to Clemson by directing a request to the College Board or the American College Testing Program. Others may secure an application for these tests from their local high school or from the College Board's Office, CN 6200, Princeton, NJ 08541-6200 or American College Testing, Box 168, Iowa City, IA 52243. Copies of student reports and those submitted by third parties, such as high schools and colleges, are not acceptable.

College Board Achievement Tests For academic placement, prospective freshmen are required to take at least one College Board Achievement Test: Mathematics, Level II. Although most decisions are reached without benefit of achievement test results, these scores sometime improve one's chances for admission. For applicants attending high schools that do not compute class rank, it may be helpful to take English and one other achievement test, in addition to Mathematics, Level II by January of the senior year. (Beginning in the spring 1994, the College Board Achievement Tests will be known as the SAT II: Subject Tests.)

Mathematics All freshman candidates are required to take the College Board Mathematics Achievement Test, Level II or Level IIc. The College Board Advanced Placement (AP) examination in Calculus is the only recognized substitute. Failure to sit for one of these tests will result in placement in remedial work that will not apply toward mathematics requirements.

Language Applicants desiring advanced placement in a foreign language may take the College Board's Achievement Test, the Advanced Placement Examination, or a test administered during summer orientation by the Department of Languages at Clemson. Advanced placement on the basis of a College Board Achievement Test begins with a score of 450 or higher and enables students to exempt one or more semesters, depending on the score earned. Credit will be awarded after completion of a higher-level (qualifying) course at Clemson with a grade of C or better.

Credit by Examination Students may receive college credit by completing one of the following examinations:

College Board Advanced Placement Program The College Board's Advanced Placement Program (AP) provides an opportunity for highly motivated high school students to begin their college careers during the last year or two of high school. AP participants take college-level courses taught in their high schools, sit for nationally administered examinations in the subjects concerned, and submit test scores to Clemson for credit. Credit is awarded to those earning scores of 3, 4, or 5 on the AP examinations.

College Board Advanced Placement Examination	AP Score	Credit Allowed Toward Degree	Credits
ECONOMICS			
Microeconomics	3, 4, 5	ECON 200	3
Macroeconomics	3, 4, 5	ECON 200	3
ENGLISH			
Composition and Literature	3, 4, 5	ENGL 101, 102	6
Language and Composition	3, 4, 5	ENGL 101, 102	6
GOVERNMENT			
American Government	3, 4, 5	PO SC 101	3
Comparative Government	3, 4, 5	PO SC 103	3
HISTORY			
American History	3, 4, 5	HIST 101, 102	6
European History	3, 4, 5	HIST 173	3
HUMANITIES			
Music Theory	3, 4, 5	MUSIC 205, 206	6
Music Literature	3, 4, 5	MUSIC 210	3
Art History	3, 4, 5	A A H 303	3
Studio Drawing	3, 4, 5	ART 205	3
General Studio	3, 4, 5	ART 203	3
LANGUAGES			
French Language	3, 4, 5	FR 101, 102	8
French Literature	3	FR 101, 102	8
	4	FR 101, 102, 201	11
	5	FR 101, 102, 201, 202	14
German Language	3, 4, 5	GER 101, 102	8
Latin (either test)	3	LAT 101, 102, 201	11
	4, 5	LAT 101, 102, 201, 202	14
Spanish Language	3, 4, 5	SPAN 101, 102	8
Spanish Literature	3	SPAN 101, 102	8
	4	SPAN 101, 102, 201	11
	5	SPAN 101, 102, 201, 202	14
MATHEMATICS			
Calculus AB	3, 4, 5	MTHSC 106	4
Calculus BC	3, 4, 5	MTHSC 106, 108	8
PSYCHOLOGY			
Psychology	3, 4, 5	PSYCH 201	3
SCIENCE			
Biology[1]	3	BIOL 103, 104	8
	4, 5	BIOL 110, 111	10
Chemistry	3, 4, 5	CH 101 and 102 or 112	8
Computer Science (either test)	3, 4, 5	CP SC 101	4
Computer Science AB[2]	5	CP SC 101, 102	8
Physics B[3]	3, 4, 5	PHYS 207, 208	8
Physics C (Mechanics)	3, 4, 5	PHYS 122, 124	4
Physics C, E, M	3, 4, 5	PHYS 221, 223	4

[1]Students enrolling in majors requiring BIOL 110, 111 will be asked to meet with the director of the biology program for further evaluation and placement counseling.

[2]With a score of 4 on the AB exam, the Department of Computer Science will review the student's record and determine whether credit will be given for CP SC 102.

[3]Students enrolling in curricula requiring calculus-based physics (PHYS 122, 221, 222, 223, 224), but who earn a grade of 5 on Physics B, will be asked to meet with a departmental representative for further evaluation and placement counseling.

College Board College-Level Examination Program (CLEP) This program has very limited recognition at Clemson. A few departments accept credit for CLEP subject-matter examinations; however, CLEP General Examinations are not recognized. Credit is awarded for introductory-level courses according to criteria established by the following departments: Chemistry, English (composition only), and Mathematical Sciences (algebra and trigonometry only—applicable principally in agricultural curricula

permitting use of MTHSC 105). Numerical scores plus essays, required when offered as part of a CLEP examination, will be evaluated by the appropriate department. CLEP is designed primarily for adults with nontraditional learning experiences; it is not generally appropriate for freshmen.

Transfer Credit Work completed at other accredited institutions with a grade of C or higher, including appropriate exemption credit, will be evaluated for transfer in terms of equivalent courses included in the Clemson curriculum of the student's choice. This does not guarantee that all courses taken at another institution will be accepted for transfer. The acceptability of each course and exemption will be based on an evaluation by the faculty concerned and will be managed by the admissions staff.

Students transferring may select the curriculum that was outlined in the *Clemson University Announcements* at the time they entered the sending institution, provided that they have been in continuous enrollment. Further, transfer students may select any curriculum adopted subsequent to that initial curriculum. After enrolling at Clemson, if transfer students change from one major to another, they will complete all of the requirements included in the new curriculum that are in effect at the time of the change. Transfer students who take more that five years from the date of initial enrollment at the sending institution to graduate may be required to take additional coursework.

Campus Visits and Tours The University Visitors Center, located in Tillman Hall, is open Monday through Friday from 8:00 a.m. to 5:00 p.m. yearround. From February through November the Center is also open on Saturday from 10:00 a.m. to 4:00 p.m. and Sunday from 2:00 p.m. to 5:00 p.m. The office is closed on selected University holidays.

Walking tours of the University are provided to better acquaint visitors with the Clemson campus. Tours depart from the Visitors Center at 10:00 a.m. and 2:00 p.m., Monday through Friday. From February through November, tours are offered at 10:00 a.m. and 2:00 p.m. on Saturday and 2:00 p.m. on Sunday. Tours are not offered during exams and transitional days between sessions, with the exception being the summer months of June, July and August. Tours last approximately one hour and are preceded by a 10-minute videotape highlighting Clemson University. Reservations are not required. Thirty-minute cassette self-guided tours are also available. For additional information and to verify tour times, call the Visitors Center at (803) 656-4789.

Prospective students are also welcome to visit with staff, faculty, and students at the University. Visits can be made to the Admissions Office without an appointment during regular office hours Monday through Friday, 8:00 a.m. to 4:30 p.m. It is best to avoid visiting the campus during the last two weeks of August and the first week of January, as these are class registration periods. The staff and faculty cannot always assist visitors at these times.

Candidates for the College of Architecture are particularly encouraged to come for a visit. Prospective students will have an opportunity to discuss the programs offered with a faculty member and tour the facilities. Appointments should be made in advance by contacting the College of Architecture.

Interviews are not required in considering candidates, nor will the results of interviews affect admissions decisions. Rather, the purpose is to provide

candidates the opportunity to learn more about the University.

Orientation Programs The University offers a series of two-day orientation programs during the summer for entering freshmen, transfer students, and their parents. All accepted students are expected to attend one of the sessions. During orientation students will have an opportunity to discuss their educational objectives with an adviser, to preregister for the fall semester, and to learn about student life. Transfer students have their transcripts evaluated and select appropriate courses for their first semester at Clemson. Those transferring may find it difficult to schedule the appropriate courses if they fail to attend one of the first eight orientation periods.

International Students A limited number of well-qualified students from other countries are accepted. The student should file an application and take the College Board's Scholastic Aptitude Test (SAT) and Test of English as a Foreign Language (TOEFL). Complete transcripts of secondary and college-level academic work also must be submitted.

ADMISSION OF POST-BACCALAUREATE STUDENTS

A student may be accepted by the Graduate School as a post-baccalaureate student if he/she applies to a specific graduate degree program but does not have the appropriate academic background. Such a student must be recommended by the appropriate department or program chairperson and should meet all other requirements for admission to the particular degree program with respect to grade-point ratio and standardized test scores. A student in this category who is denied admission because of failure to meet the minimum requirements has access to the same appeal procedure as does any other student applying to the Graduate School.

Applicants will be classified as post-baccalaureate student if they are not qualified to take at least one graduate course per semester which can be included in the minimum hours required for the graduate degree. Additionally, any student required to complete more than eighteen semester hours of undergraduate credits will be classified as post-baccalaureate. Until such time that the required number of undergraduate credit hours is less than or equal to eighteen and the student is qualified to take, each semester, a graduate course which can be included in the minimum hours required for the graduate degree, he/she will remain classified as post-baccalaureate. A department or a student may request post-baccalaureate status even though the above criteria are satisfied.

At the time a post-baccalaureate student becomes eligible for classification as a graduate student, the decision as to eventual admission status (full or provisional) will be made according to criteria utilized by the department and Graduate School for all other applicants to the particular degree program. The post-baccalaureate student is expected to maintain a B average and receive no grade lower than C in order to qualify for admission to a graduate program.

Post-baccalaureate students may enroll in the same number of credits per semester as any undergraduate student but shall not enroll in graduate courses or receive a graduate assistantship. No degree or certificate shall be awarded to students in a post-baccalaureate status and such students who

subsequently desire to obtain an additional baccalaureate degree must apply through the Office of Admissions and Registration. The applicability of credits earned toward the undergraduate degree will be determined by the policy pertaining to transfer students. Tuition and fees for post-baccalaureate students shall be those applicable to undergraduates with the exception of the application fee and admissions deposit.

A student possessing an undergraduate degree or a graduate degree and who wishes to enroll in specific undergraduate courses for reasons other than future admission to the Graduate School shall not be classified as post-baccalaureate and shall be governed by policies established by the Office of Admissions and Registration.

READMISSION OF FORMER UNDERGRADUATE STUDENTS

Students who previously have attended Clemson and who wish to return must secure an application for reentrance from the Registrar's Office. Students who have attended another institution while away must submit an official transcript from that institution. Readmission to the program in which the student was previously enrolled is not always automatic. An interview may be requested by the department.

Financial Information

The annual State Appropriation Act imposes the general requirement that student fees be fixed by the University Board of Trustees. The Act imposes two specific requirements on the Board: (1) In fixing fees applicable to academic and general maintenance and operation costs, the Board must maintain a minimum student fee not less than the fee charged the previous year. (2) In fixing fees applicable to dormitory rental, dining halls, laundry, infirmary, and all other personal subsistence expenses, the Board must charge students an amount sufficient to fully cover the cost of providing such facilities and services.

The tuition and fees for all undergraduate students—full or part time, and auditing—are shown below. Satisfactory settlement of all expenses is a requirement for completing each semester's class registration, and no student is officially enrolled until all past due accounts have been satisfied.

In special cases the University will accept, at the beginning of a semester, a noninterest-bearing promissory note for a portion of the semester housing and semester meal-plan fee. Amounts up to $350 for room rent and $350 for 5- or 7-day meal plans may be included in the note. In such cases, a note for the fall semester charges will be due October 1, and for the spring semester, March 1. Failure to pay the note when due will result in the assessment of late fees, including collection costs, denial of future deferred payment note privileges, and termination of board plan and/or cancellation of housing contract.

Currently enrolled students who expect to continue enrollment are given an opportunity to make housing reservations by paying a $95 housing advance payment and by signing up on the computer during the spring semester at a time designated by the Housing Office.

New students who are offered on-campus housing accommodations must pay a nonrefundable $15 application fee and a $100 admissions deposit. The admissions deposit is deducted from the amount otherwise due for the first semester expenses.

TUITION AND FEES

Actual charges for 1993-94 are not known when the catalog is printed. The charges reflected below are for 1992-93 and are subject to change as conditions warrant.

	Resident	*Nonresident*
Full-time academic fee	$1,291.00	$3,600.00
Part-time academic fee (per semester hour)	$ 106.00	$ 300.00
Auditing academic fee (per semester hour)	$ 53.00	$ 150.00
Staff academic fee (per semester hour)		$ 53.00
Graduate assistant academic fee		$ 340.00

Laboratory fee (per laboratory); nonrefundable after last day to add	$ 15.00
Medical fee (Must be paid by full-time students and/or students in University housing.)	$ 90.00
Residence Halls (per semester)	
Johnstone Hall (Sections A, D-F)	$ 670.00
Benet, Bowen, Bradley, Cope, Donaldson, Geer, Johnstone (Annexes A, F), Norris, Sanders, Wannamaker, Young	$ 770.00
Barnett, Byrnes, Lever, Manning, Smith	$ 860.00
Mauldin	$ 885.00
Clemson House (room)	$ 870.00
Clemson House (kitchenette)	$ 905.00
Thornhill Village (four occupants)	$ 960.00
Patrick Noble Calhoun Courts Apartments (four occupants)	$1,075.00
Lightsey Bridge Apartments	$1,100.00
Study and Utility Rooms	$ 600.00
Family Housing (per month)	
Townhouses	$ 255.00
Duplex - 2 Bedroom	$ 280.00
Duplex - 3 Bedroom	$ 330.00
Faculty Houses	$ 340.00
Board Plans[1]	
Five-Day Plan (15 meals), Monday thru Friday	$ 698.00[2]
Any 10 Plan (10 meals), Monday thru Sunday	$ 688.00[2]
Seven-Day Plan (21 meals), Monday thru Sunday	$ 819.00[2]
Tiger Stripe Account (declining balance account)	$ 50.00

Late Registration Service Charge Registration for classes is scheduled for specific days, and certain definite procedures are outlined to prevent or reduce the problems incident to late registration. A student has not completed registration until all required steps have been taken, the final being the return of the registration form, and if not preregistered for classes the properly signed class registration card to the Office of Admissions and Registration. Any student failing to complete registration on the specified class registration days will incur a service charge.

Full-time Fees Undergraduates and graduate students must be enrolled in 12 semester hours to pay full-time fees. Students enrolled for less than 12 hours or who drop below 12 hours may become ineligible for some student services, financial aid, or other beneficial programs.

Part-time Fees Undergraduate and graduate students taking less than 12 semester credit hours will be charged each semester according to the above schedule. These fees do not provide for admission to athletic events, concert series, and other such activities.

[1]All first-year freshmen who live in University housing (excluding Calhoun Courts, Clemson House Apartments, Lightsey Bridge Apartments, and Thornhill Village) are required to subscribe to one of the three board plans for their first two semesters. All other students have the option of selecting a meal plan on a semester basis or paying the prevailing cash price for individual meals.

[2]Prices reflect 1992-93 rates and are subject to change.

Returned Checks A check or charge card given in payment of University expenses or a check cashed by the University that is returned unpaid by the bank immediately creates an indebtedness to the University. The Office of Business Affairs, G-08 Sikes Hall, administers matters related to the collection of all returned checks for students and nonstudents.

The Bursar's Office will redeposit returned checks in payment of academic fees for the fall and spring semesters. A $15 returned check charge will be assessed for each returned item in accordance with state laws. Students with returned items for payment of academic fees are also subject to a late payment fee of $5 per calendar day, not to exceed $350, beginning on the day after the last day of late registration. If the note was returned to the University in a timely manner with no response by the student or drawer, a written request to disenroll the student is made to the Registrar. If the request is approved, the percentage of refund will be applied to the debt. If the check is returned after the mid-point of the semester with no response, a decision will be made by the Director of Business Affairs and the Registrar as to the effects of disenrollment. At this point, the student will owe 100% of tuition and fees, even if he/she has been disenrolled. The University may restrict subsequent payment for academic and other fees by accepting only cash, certified checks, cashier's checks, or money order.

Any individual who cashes a two-party check or uses a two-party check for payment of University expenses will be held responsible for that check if it is returned unpaid by the bank. Checks used as payment for various University services, such as meal plans, housing, etc., that are later returned unpaid by the bank, give the University the right to cancel such services and cause forfeiture of any refund.

Any returned check not collected by the above procedures may be turned over to a collection agency and the indebtedness reported to a credit bureau. Costs of collection will be added to the debt. Transcripts and diplomas will be withheld pending payment, and the debt may be deducted from state income tax refunds.

Abuse of check cashing and check payment privileges may result in the restriction of such privileges for an indefinite period of time based on the frequency and/or dollar amount, as determined by the Business Affairs Office.

Past Due Accounts Any indebtedness to the University which becomes past due immediately jeopardizes the student's enrollment, and no such student will be permitted to reenroll for an ensuing semester or summer school term. Billing fees and/or collection costs may be added to the indebtedness. Further, any student who fails to pay all indebtedness, including collection costs, to the University may not be issued a transcript or diploma. Unresolved debts may be turned over to a collection agency, be reported to a credit bureau and deducted from state income tax refunds. Debts include but are not limited to the following: parking violations, library fines, rent, academic fees, and others.

Refund of Academic Fees (Tuition, University Fee, and Medical Fee) for Students Withdrawing, Dropping to Part time, or Part-time Students Dropping Credit Hours No refunds will be made on a semester's tuition and fees after four weeks from the last day to register. In the case of a withdrawal from the university, refunds will be based on the date the

Schedule Change Form is returned to the Registrar's Office. To be eligible for a refund, the student's request must be received by the Office of Business Affairs prior to the beginning of the next fall/spring semester or subsequent summer term. Beginning with the day following the last day to register, refunds for periods of four weeks or less during fall/spring semester shall be made on the following basis:

Period of Enrollment After the Last Day to Register	*Percent Refunded*
One week or less	80%
More than 1 but not more than 2 weeks	60%
More than 2 but not more than 3 weeks	40%
More than 3 but not more than 4 weeks	20%
More than 4 weeks	0%

Refund of Dining Hall and Residence Hall Fees Specific information relating to living-expense refunds is given in the sections on Housing and Student Food Service.

Refunds of Financial Aid for Students Withdrawing from the University Refunds for academic fees will be made in accordance with the semester and summer session refund policies. University housing refunds will be made in accordance with the housing contract.

Refunds for meal plans will be made on pro rata basis.

Since Financial Aid is expected to meet or help meet educational costs, any academic fee, housing, or meal-plan fee for students withdrawing from the University up to the amount of financial aid received for that semester or summer session, will be refunded to the Financial Aid Program(s) from which the student received assistance.

To determine the amount of refund that will be returned to Federal Title IV Aid Programs and what amount will be returned to the non-Title IV Aid Programs, the following formula will be used:

Federal Title IV Refund =

$$\text{(Amount of Refund)} \times \frac{\text{Title IV Aid Received}}{\text{Total Aid Received}}$$

Non-Title IV Refund = Amount of Refund minus Title IV Refund

In refunding monies to the various Financial Aid Programs, the following priority listings will be used.

A. Title IV Federal Programs
   1. Perkins Loan
   2. Supplemental Educational Opportunity Grant
   3. Stafford (GSL), Plus, SLS Loans
   4. Pell Grant

B. Non-Title IV Programs
   1. Institutional Loans
   2. Institutional Scholarships and/or Grants
   3. Private Loans/Scholarships

After the refund has been applied to the Title IV and non-Title IV programs, any refund balance will be refunded to the student.

If debts were incurred before withdrawing, such as bad checks, unpaid

traffic fines, library fines, and others, the refund will cover these obligations first. Academic fees, housing, and meal-plan refunds for students withdrawing will be paid to the student.

Transcripts Official transcripts may be obtained from the Transcripts/ Registrar's Office at $3.00 each. Students with past due indebtedness to the University or who are under disciplinary sanctions may not be issued transcripts. Transcripts requested in person are normally available for pickup during the next business day. Allow one week to ten days for delivery of mail requests.

RESIDENT TUITION AND FEES

Application for Resident Status—Any student or prospective student whose status concerning entitlement to payment of in-state tuition and fees is uncertain has the responsibility of securing a ruling from the University by providing all relevant information on special application forms. These forms can be obtained from the Office of the Dean of Admissions and Registration and are to be completed and returned to that office at least two weeks prior to registration for any semester or summer term for which the student is attempting to qualify for payment of the in-state tuition and fee rate.

Entitlement—Eligibility for payment of in-state tuition and fees shall be determined under the provisions of Sections 59-112-10 through 59-112-100, South Carolina Code of Laws, 1976, as amended. This law is set forth in its entirety as follows (subject to further amendment by the General Assembly).

Definitions—Section 59-112-10. As used in this chapter:

A. The words "State Institution" shall mean those post-secondary educational institutions under the jurisdiction of the following: (1) Board of Trustees, Clemson University; (2) Board of Trustees, Medical University of South Carolina; (3) Board of Trustees, South Carolina State College; (4) State College Board of Trustees; (5) Board of Visitors, The Citadel; (6) Board of Trustees, University of South Carolina; (7) Board of Trustees, Winthrop College; and (8) State Board of Technical and Comprehensive Education.

B. The word "student" shall mean any person enrolled for studies in any state institution.

C. The word "residence" or "reside" shall mean continuous and permanent physical presence within this State, provided, that temporary absences for short periods of time shall not affect the establishment of a residence.

D. The word "domicile" shall mean a person's true, fixed, principal residence and place of habitation; it shall indicate the place where such person intends to remain, and to which such person expects to return upon leaving without establishing a new domicile in another state. For purposes of this section one may have only one legal domicile; one is presumed to abandon automatically an old domicile upon establishing a new one. Housing provided on an academic session basis for students at State institutions shall be presumed not to be a place of principal residence, as residency in such housing is by nature temporary.

E. The words "in-state rates" shall mean charges for tuition and fees established by State Institutions for persons who are domiciled in South Carolina in accordance with this act; the words "out-of-state rates" shall mean

charges for tuition and fees established by State Institutions for persons who are not domiciled in South Carolina in accordance with this act.

F. The words "independent person" shall mean a person in his majority, or an emancipated minor, whose predominant source of income is his own earnings or income from employment, investments, or payments from trusts, grants, scholarships, loan, or payments of alimony or separate maintenance made pursuant to court order.

G. The words 'dependent' or 'dependent person' mean:

(1) one whose financial support is provided not through his own earnings or entitlements, but whose predominant source of income or support is payments from a parent, spouse, or guardian, and who qualifies as a dependent or an exemption on the federal tax return of the parent, spouse, or guardian; or

(2) one for whom payments are made, under court order, for child support and the cost of his college education by an independent person meeting the provisions of Section 59-112-20 A or B.

However, the words 'dependent' or 'dependent person' do not include a spouse or former spouse who is the recipient of alimony or separate maintenance payments made pursuant to court order.

H. The word "minor" shall mean a person who has not attained the age of eighteen years; and the words "emancipated minor" shall mean a minor whose parents have entirely surrendered the right to the care, custody and earnings of such minor and are no longer under any legal obligation to support or maintain such minor.

I. The word "parent" shall mean a person's natural or adoptive father or mother; or if one parent has custody of the child, the parent having custody; or if there is a guardian or other legal custodian of such person, then such guardian or legal custodian; provided; however, that where circumstances indicate that such guardianship or custodianship was created primarily for the purpose of conferring South Carolina domicile for tuition and fee purposes on such child or dependent person, it shall not be given such effect.

J. The word "spouse" shall mean the husband or wife of a married person.

South Carolina Domicile Defined for Purposes of Rates of Tuition and Fees—Section 59-112-20. South Carolina Domicile for tuition and fee purposes shall be established as follows in determinations of rates of tuition and fees to be paid by students entering or attending State Institutions:

A. Independent persons who reside in and have been domiciled in South Carolina for a period of no less than twelve months with an intention of making a permanent home herein, and their dependents, may be considered eligible for in-state rates.

B. Independent persons who reside in and have been domiciled in South Carolina for fewer than twelve months but who have full-time employment in the State, and their dependents, may be considered eligible for in-state rates for as long as such independent person is employed on a full-time basis in the State.

C. Where an independent person meeting the provisions of Section 2 B above, is living apart from his spouse, or where such person and his spouse are separated or divorced, the spouse and dependents of such independent person shall have domiciliary status for tuition and fee purposes only under

the following circumstances:

(1) if the spouse requesting domiciliary status for tuition and fee purposes remains domiciled in South Carolina although living apart or separated from his or her employed spouse.

(2) if the dependent requesting domiciliary status for tuition and fee purposes is under the legal custody or guardianship, as defined in Section 1 I above, of an independent person who is domiciled in this State; or if such dependent is claimed as an income tax exemption by the parent not having legal custody but paying child-support, so long as either parent remains domiciled in South Carolina.

D. The residence and domicile of a dependent minor shall be presumed to be that of the parent of such dependent minor.

Effect of Change of Residency—Section 59-112-30. When the domicile of a student or of the person upon whom a student is financially dependent changes after enrollment at a State Institution, tuition charges shall be adjusted as follows:

A. Except as provided in Section 2 B above, when domicile is taken in South Carolina, a student shall not become eligible for in-state rates until the beginning of the next academic session after expiration of twelve months from date of domicile in this State.

B. When South Carolina domicile is lost, eligibility for in-state rates shall end on the last day of the academic session in which the loss occurs; however, application of this subsection shall be at the discretion of the institution involved.

C. Notwithstanding the other provisions of this section, any dependent person who has been domiciled with his family in South Carolina for a period of not less than three years immediately prior to his enrollment may enroll in a state-supported institution of higher learning at the in-state rate and may continue to be enrolled at such rate even if the parent, spouse, or guardian upon whom he is dependent moves his domicile from this State.

Effect of Marriage—Section 59-112-40. Except as provided in Section 2 above, marriage shall affect determinations of domicile for tuition and fee purposes only insofar as it operates to evince an intention by the parties to make a permanent home in South Carolina.

Military Personnel and Their Dependents—Section 59-112-50. Notwithstanding other provisions of this act, during the period of their assignment to duty in South Carolina members of the armed services of the United States stationed in South Carolina and their dependents may be considered eligible for in-state rates. When such armed service personnel are ordered away from the State, their dependents may continue for an additional twelve months to have this eligibility at the State Institutions where they are enrolled at the time such assignment ends. Such persons and their dependents may be considered eligible for in-state rates for a period of twelve months after their discharge from the armed services even though they were not enrolled at a State Institution at the time of their discharge, if they have evinced an intent to establish domicile in South Carolina and if they have resided in South Carolina for a period of at least twelve months immediately preceding their discharge.

Faculty, Administrative Employees and Dependents Thereof—Section 59-112-60. Full-time faculty and administrative employees of State Institutions, and the spouses and children of such persons, shall be excluded from the provision of this act.

Abatement of Rates for Nonresidents on Scholarship—Section 59-112-70. Notwithstanding other provisions of this act, the governing boards listed in Section 1 A above, are authorized to adopt policies for the abatement of any part or all of the out-of-state rates for students who are recipients of scholarship aid.

Administration of Chapter; Burden of Proving Eligibility on Students—Section 59-112-80. Each State Institution shall designate an official to administer the provisions of this act. Students making application to pay tuition and fees at in-state rates shall have the burden of proving to the satisfaction of the aforesaid officials of State Institutions that they have fulfilled the requirements of this act before they shall be permitted to pay tuition and fees at such rate.

Penalties for Willful Misrepresentation—Section 59-112-90. Where it appears to the satisfaction of officials charged with administration of these provisions that a person has gained domiciliary status improperly by making or presenting willful misrepresentations of fact, such persons should be charged tuition and fees past due and unpaid at the out-of-state rate, plus interest at a rate of eight percent per annum, plus a penalty amounting to twenty-five percent of the out-of-state rate for one semester; and until these charges have been paid no such student shall be allowed to receive transcripts or graduate from any State Institution.

Regulations—Section 59-112-100. The Commission of Higher Education may prescribe uniform regulations for application of the provisions of this act and may provide for annual review of such regulations.

FOOD SERVICE

The University provides several economical meal plans. Harcombe and Schilletter dining halls feature an unlimited seconds policy, except on selected entrees, while Clemson House dining rooms, Canteen and Fernow Street Cafe serve meals on a la carte basis. Students dining at the Clemson House may use the meal card as a cash equivalency or for a predesignated meal at no additional cost. Meals may also be purchased on a cash basis or with the Tiger Stripe Account (declining balance account).

The "branding" concept in dining facilities on college campuses is available on the Clemson campus. Li'l Dino Subs and Taco Bell Express are located at the East Camus Convenience Store; Chik-fil-A is located at the Union Canteen; and the Pizza Hut Express is at the new Fernow Street Cafe. All of these dining facilities accept the Tiger Stripe Account and cash.

Students may choose one of several meal plans or a Tiger Stripe declining balance account. These meal plans are outlined in the Clemson Dining Service brochure.

Meal plans begin immediately after a student obtains a meal plan at the beginning of the semester and end after the evening meal on the day of graduation at the end of each semester.

All first-year freshmen who live in University housing, excluding Calhoun Courts, Clemson House, Thornhill Village and Lightsey Bridge Apartments are required to subscribe to a meal plan for their first two semesters. All other students may choose a meal plan on a semester basis or pay for individual meals. First-year freshmen living in University housing (excluding the aforementioned housing) may terminate this agreement for one of the following reasons:

1. Withdrawal from Clemson University.
2. Change in housing assignment to an apartment with kitchen facilities.
3. Medical condition with dietary requirements that cannot be met by Dining Services. Documentation from a medical doctor must be provided along with specific dietary requirements. This documentation will be reviewed by the Dining Services Registered Dietician.
4. Other circumstances determined by the University to be beyond the student's control.

Students must provide the necessary documentation for any of the above reasons before a decision on the cancellation of this contract will be considered. Upperclassmen may terminate this agreement for any reason.

Failure to participate in a meal plan does not automatically release a student from his/her meal contract.

Students may change meal plans at the billing of spring semester fees with no service charge. Students may change meal plans after the first two weeks and prior to the last six weeks of the semester by paying a $25 service charge. Changes may be made at the Campus Card Access Office in Harcombe Dining Hall on Mondays only. All adjustments will be prorated, except for students withdrawing from the University. Students may upgrade during the registration period.

Contracts cancelled for any reason after service of the first meal will result in a refund of advance payment minus a $50 termination charge and a weekly charge for meals available. The meals available charge applies to the meals that have been served, and not those that have been eaten by the individual student. No refunds will be made the last six weeks of any semester. Requests for refunds may be made at the Campus Card Access Office located in Harcombe Dining Hall.

TIGER STRIPE ACCOUNT (DECLINING BALANCE ACCOUNT)

Under the Tiger Stripe Account program, monies are deposited into an account prior to usage. The Tiger Stripe Account is equivalent to a prepaid credit card. As meals or other items are purchased from dining facilities, post office, CATS, bookstore, telecommunications, Redfern Health Center, East Campus Store, Uniquely Clemson Agricultural Products Sales Center, Union Copy Center, Edgars Game Room, vending machines, or laundry, the amount spent is deducted from the Tiger Stripe Account balance. All students are eligible. (First-year freshmen living in University housing (excluding Calhoun Courts, Clemson House Apartments, Lightsey Bridge Apartments, and Thornhill Village) during their first two semesters are required to participate in one of the meal contracts. First-year freshmen may, however, participate in the Tiger Stripe Account program in addition to the required meal contract.) There is a $50 minimum deposit required to open a

Tiger Stripe Account.

Additions to the Tiger Stripe Account after registration must be made in amounts of not less than $25.

Tiger Stripe Accounts are not refundable except for students withdrawing, graduating, or not returning. Credit balances at the end of each semester will carry forward to the next semester or term. Students withdrawing during the semester must submit written requests for refunds in an amount greater that $5. Requests will be accepted at the Campus Card Access Office not later than 30 days after the end of the semester or term for those students graduating or not returning. After this time any refunds will be forfeited. Any indebtedness to the University will be deducted from refunds issued.

UNDERGRADUATE FINANCIAL AID

The Office of Student Financial Aid administers and/or coordinates various types of undergraduate financial aid administered by Clemson University: scholarships, loans, grants, and part-time employment. The office works jointly with the Financial Aid and Placement Committee and the University Scholarships and Awards Committee.

Students may apply after January 1 for financial assistance for the next academic year. Financial aid requests, based on financial need, must be supported by a valid need analysis form and renewed annually.

The cutoff date for scholarship application submission is March 1. The need analysis form must be submitted by February 1 for need-based scholarship consideration and by April 1 for the federally funded Supplemental Educational Opportunity Grant (SEOG), College Workstudy (CWSP), and Perkins Loan. April 1 is the suggested deadline for application for the Pell Grant and Stafford Loan.

A brochure detailing the financial aid programs at Clemson University can be obtained from Student Financial Aid, G-01 Sikes Hall, Clemson University or by calling (803) 656-2280.

Satisfactory Academic Progress for Financial Aid Eligibility Students must maintain satisfactory academic progress to be eligible for financial aid. This policy contains both qualitative (grade-point ratio) and quantitative (credit hours completed) requirements. Students must meet the grade-point ratio requirement as stated under the Continuing Enrollment Policy in the Academic Regulations section. Students must also complete 12, 9, or 6 hours per semester according to their enrollment (full time, 3/4 time, or 1/2 time) as of the last day to add a course. Duplicate credit taken at Clemson University does not count toward satisfactory progress. Details are available in the publication *Financial Aid Opportunities at Clemson University.* Students wishing to appeal their academic progress status may submit a letter to Student Financial Aid. This appeals process is separate from the Appeals Committee on Continuing Enrollment. Students returning under academic renewal should submit an appeal to Student Financial Aid to update their academic progress record.

EDUCATIONAL BENEFITS FOR VETERANS, WAR ORPHANS, AND CHILDREN OF DECEASED OR DISABLED LAW ENFORCEMENT OFFICERS OR FIRE FIGHTERS

The Veterans Administration provides educational assistance for veterans and children of deceased or totally disabled veterans who meet requirements of applicable laws and regulations. Any veteran or child of a deceased or totally disabled veteran should communicate with the nearest Veterans Administration Office to determine whether or not he/she is entitled to any educational benefits. Free tuition is available to children of South Carolina law enforcement officers or fire fighters who were totally disabled or killed in the line of duty. Certification is required from the agency of the parent's employment. Upon presentation of proof of eligibility, a student shall not become eligible for educational assistance until the beginning of the academic session.

Student Services

HOUSING

Single Student Housing University housing, consisting of residence halls and apartment units will accommodate 6,800 single students. Rooms in residence halls are double occupancy, and the two-bedroom apartments will each accommodate four students. All single-student housing is air conditioned and furnished in a manner that meets the needs of today's college student. Upon returning a University Housing Application/Waiting List Card which is included in their application from the Admissions Office, new students are provided complete housing information. Graduate students and former students should write to the Housing Office for these materials. Refunds will be made in accordance with the housing contract.

Family Housing Clemson provides 100 apartments for married students. These apartments formerly served as faculty and staff housing and are located on campus. Graduate students are given priority of assignment to married student housing. Brochures and application forms may be obtained by writing to the Family Housing Office, 200 Mell Hall, Clemson University, Clemson, South Carolina 29634-4075.

HEALTH SERVICE

The Student Health Service is housed in the Redfern Health Center. Full-time staff consists of a director, five physicians, two clinical psychologists, three nurse practitioners, twenty-two registered nurses, two registered X-ray technicians, three registered laboratory technicians, a registered pharmacist, and a health educator. The best of modern equipment is available for student use. Regular office hours are maintained.

The Student Health Service has several important functions. All of these are aimed at keeping the student in good health so that he may effectively pursue higher education. There is, of course, the basic function of medical care for the ill and injured. This is a vital part of its work. In addition, the Student Health Service promotes the concept of wellness and individual responsibility for health maintenance. The Health Center addresses behavioral health issues with diverse educational offerings.

Payment of the Student Health Service fee is required of all students living in University housing and all full-time students even though they do not reside in University housing. The medical fee paid by each student covers the services of the University physicians and the Health Service staff. This coverage is given under conditions similar to that of one's own physician. The major cost exception is prescription drugs.

The fee does not cover routine physical examinations for employment or transfer to another school, referrals to other physicians, medical or surgical services performed away from the University.

A complete pharmacy is maintained and dispenses medication to students

as prescribed by the staff physicians on a cost-plus service basis. Students are encouraged to pay for medications when received and may pay by cash, check, Master Charge, Visa, or Tiger Stripe. Clemson University maintains a licensed emergency medical service which includes a modern modular ambulance and sufficient certified emergency medical technicians for 24-hour-a-day service. All medical emergencies on campus will be handled by the unit. Ambulance service to Redfern from on campus is provided at no cost to the student. Students transferred in an ambulance from Redfern to another hospital or physicians office will be charged a basic fee of $80 plus fees for special services.

Medical Questionnaire Completion of a medical history questionnaire is required of all new students entering Clemson University for the first time. This is to be completed by the student and mailed directly to Redfern Health Center, Clemson University, Clemson, South Carolina 29631.

Immunization requirements for admission are documented proof of two Red Measles (Rubeola) vaccines since the age of 12 months and a current (within in the past year) PPD (tuberculosis screening) skin test. Students will not be allowed to complete registration until the above requirements are met.

COUNSELING AND PSYCHOLOGICAL SERVICES

The goal of the Counseling Center is to provide students with a service for personal counseling and self-improvement. College is filled with pressures, changes, and decisions. The Counseling Center offers students a place to come and speak confidentially about matters related to adjusting to adulthood and improving the ability to enjoy life and be productive. The Center serves two large areas of concern:

First, are performance issues; that is, ways to improve the quality and variety of an already successful lifestyle. Improvement in areas such as overcoming test anxiety, building motivational patterns that work, developing better time-management skills and study skills, overcoming shyness, learning how to relax and how to motivate others are but a few of the many areas covered.

Second, are concerns that focus on helping students who are experiencing difficulties adjusting to college. Concerns in this area include feeling depressed, not being able to communicate clearly, homesickness, difficulties with love relationships, and other feelings that can disrupt a rewarding college experience. All sessions are confidential and free of charge to Clemson University students. These services are available at two locations: Redfern Health Center (656-2239) or Counseling and Psychological Services (656-2451).

CAREER SERVICES

The Career Center assists students with all aspects of career planning and helps them to find summer internships and full-time employment.

To help with career planning, the Career Center has developed a three-step process known as the Career-Success System which leads students through the process of developing a career plan that should result in a satis-

fying and meaningful career. Individual career counseling is offered, as well as career library and state-of-the-art computerized career guidance.

The Placement Office in the Career Center coordinates and plans campus interview visits with representatives from business, industry, and government agencies. A sophisticated employer database on the mainframe makes it convenient for students to research employers or to sign up for interviews from terminals anywhere on campus. Seminars, video tapes, and individual assistance with resumes and interviews are also available.

For a quarterly fee of $30, alumni may register for a biweekly job placement bulletin.

DISABILITY SERVICES

Clemson University is committed to providing equal educational opportunities to all students and assisting students in making their college experiences successful and positive. The Office of Student Development Programs serves the special needs of students with permanent disabilities. Individuals requesting services should provide current (within the last 3 years) documentation of their disability from their physician or other professional. This information should be forwarded to the Office of Student Development Programs by July 1 or within ten days of acceptance to the University. Prospective students are encouraged to visit the campus and schedule a meeting with the coordinator of Disabilities Services to discuss special needs.

Clemson University recognizes a student with a disability as anyone who has a physical or mental impairment that substantially limits one or more of his/her major life activities. In compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Clemson University has appointed a coordinator of Disability Services as well as a University committee on Access and Accommodations for Individuals with Disabilities. One of the primary responsibilities of the coordinator and the committee is to help integrate the student into the normal academic process. In addition, the committee identifies problem areas, develops solutions to these problems, monitors the effectiveness of the programs for the disabled students, and makes recommendations where actions or policies are needed. Additional information is available in the Office of Student Development Programs, 113 Holtzendorff; or call (803) 656-0511.

ACCIDENT AND SICKNESS INSURANCE

An accident and sickness insurance plan is available to all full- and part-time students and their dependents. Information concerning the insurance program is sent to students and parents with the fall semester prepayment material. Additional information may be obtained from the Student Health Service Office. This insurance is designed to cover major medical expenses not covered by the Health Service.

Academic Regulations

Proper discharge of all duties is required at Clemson University, and a student's first duty is his scholastic work. All students should be thoroughly acquainted with and cognizant of these basic requirements.

Credit System The semester hour is the basis of all credits. Generally, one recitation hour or three laboratory or shop hours a week for a semester constitute a semester hour. Thus, in ENGL 101 Composition I, 3(3,0), as you will find this subject listed in the Course of Instruction, the student takes three semester hours. When the course is completed satisfactorily, three credit hours are entered on the student's record. The notation "3(3,0)" means that the course carries three credits, has three clock hours of theory or recitation per week, and no laboratory hours. CH 101 General Chemistry, 4(3,3), carries four semester hours, has three hours of theory, and a three-hour laboratory period.

Grading System The grading system is as follows:

A—Excellent Indicates that the student is doing work of a very high character, the highest grade given.

B—Good Indicates work that is definitely above average, though not of the highest quality.

C—Fair Indicates work of average or medium character.

D—Pass Indicates work below average and unsatisfactory, the lowest passing grade.

F—Failed Indicates that a student knows so little of the subject that it must be repeated in order that credit may be received.

I—Incomplete Indicates that a relatively small part of the semester's work remains undone. Grade I is not given a student who made a grade F on his daily work. Students are allowed thirty days after the beginning of the next scheduled session, excluding summers and regardless of the student's enrollment status, to remove the incomplete grade. Normally, only one extension for each I may be granted, and this under unusual circumstances. The extension must be approved in writing by the instructor of the course and the head of the department in which the course was taken. The extension will indicate the nature and amount of work to be completed and the time limit. (Students under this policy are prohibited from removing the I by repeating the course.) A letter grade of I converts to F unless the incomplete is removed within the time specified.

W—Withdrew This grade indicates that the student withdrew from the course or was withdrawn by the instructor after the first four weeks of classwork and prior to the last five weeks of classes, not including the examination period. Each undergraduate student is allowed to withdraw or be withdrawn with a grade of W from no more than 14 hours of coursework during the entire academic career at Clemson University. Transfer students may withdraw from no more than 10 percent of the total work remaining to be done in the chosen undergraduate curriculum at the time of

transfer to Clemson University up to a total of 14 hours of coursework, whichever is fewer. Partial credit for courses cannot be dropped. A student who exceeds these limits of hours or who is enrolled during any part of the last five weeks of classes shall have final grades recorded. A student may withdraw from the University subject to the restrictions above. Any variance from these restrictions must be approved by the provost or the provost's designee and must be requested within 120 calendar days from the date printed on the grade report. The student must document the circumstances supporting the request.

Pass/Fail Option Juniors or Seniors enrolled in a four-year curriculum may take four courses (maximum of 15 credit hours), with not more than two courses in a given semester on a Pass/Fail basis. Transfer and five-year program students may take Pass/Fail courses on a pro rata basis.

Only courses to be used as free electives may be taken optionally as Pass/Fail.

Letter-graded courses which have been failed may not be repeated Pass/Fail.

Honors Program may exercise an option as to acceptance of Pass/Fail grading for Honors courses.

Registration in Pass/Fail courses will be handled in the same manner as for regular enrollment. Departmental approval must be obtained via approval form and returned to the Office of Admissions and Registration in accordance with the University Calendar for adding courses.

Instructors will submit letter grades to the Office of Admissions and Registration. These grades will then be converted as follows: A, B, C to P (pass); D, F to F (fail). Only P (minimum letter grade of C) or F will be shown on a student's permanent record and will not affect the grade-point ratio.

If a student changes to a major which requires a previously passed course, and this course has been taken Pass/Fail, he may request either to take the course on a letter-graded basis, the P be changed to C, or substitution of another course.

In the event limited enrollment in a class is necessary, priority will be given as follows: majors, letter-graded students, Pass/Fail students, and auditors.

Cross-Listed Courses A cross-listed course is one course that can be taken for credit under different departmental titles. For example, students can take Demography as either R S 471 or SOC 471. The student should select the desired departmental title in conference with an adviser. The departmental title may be changed only during the period allowed by the academic calendar for adding a course.

Advanced Placement and Credit by Examination In addition to earning credit by the usual method involving classroom attendance, a student may receive credit toward his degree by completing a course successfully by examination only.

Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program and have the results of these tests sent to Clemson.

Certain departments will also grant credit for successful completion of College-Level-Examination Program (CLEP) subject examinations which

are administered by the College Board.

Credit may be earned by enrolled students by means of a special examination without the necessity of class attendance subject to the following requirements:

1. The applicant must present evidence which would indicate that he has received training or taken work which is approximately equivalent to that given in the course at Clemson for which an examination is requested and that an examination is warranted.
2. The applicant must not have previously failed or audited the course at Clemson.
3. The applicant must apply in writing for the examination and the request must be approved by the instructor, head of the department in which the course is taught, dean of the college in which the course is taught, and the Dean of Admissions and Registration. Application forms are available in the Office of Admissions and Registration.
4. Credit (CR) will be awarded for acceptable work in lieu of letter grades in recognition of college-level achievement as determined by College Board Advanced Placement Examination, College-Level-Examination Program subject examination, institutional special examinations, and similar instruments.

ROTC Credit No more than ten hours of aerospace studies or military science may be counted toward the baccalaureate degree in any curriculum.

Transfer Credit Clemson students may receive credit for work taken at another institution; however, approval of the work should be obtained by the student prior to scheduling the work. By obtaining advance approval, the student is assured of receiving proper credit at Clemson provided he passes the work with a grade of C or higher. Information and forms relative to this approval may be obtained in the Office of Records, 104 Sikes Hall.

No course taken at a nonbaccalaureate-degree institution may be used as an equivalent or substitute for any 300- or 400-level Clemson course.

Credit Load Except for an entering freshman who is restricted to the curriculum requirements of his major course, the credit load for an undergraduate must be approved by his class adviser. The class adviser will approve a credit load deemed in the best interest of the student based on such factors as course requirements, grade-point ratio, participation in other activities, and expected date of graduation.

The maximum number of hours in which a student may enroll is 21, and 15 is the maximum credit hours for those of probation. Written permission of the department head in which the student is a major is required for all registration involving more than 21 hours, or 15 maximum credit hours for those on probation.

Repeating Courses Passed A student may repeat a course he has passed with a grade lower than B. Both grades will be calculated in the grade-point average. However, credit for the course will be counted only once toward the number of hours required for graduation.

Repeating Courses Failed A student who has failed a course (made F) cannot receive credit for that course until it has been satisfactorily repeated hour for hour in a class, except that in the case of correlated laboratory

work, the number of hours to be taken shall be determined by the instructor. Where separate grades for class and laboratory work are given, that part of the subject shall be repeated in which the failure occurs. Successfully repeating a course previously graded F does not erase the original F grade from student's record. Both grades will appear on the record and will be computed in the grade-point average.

Grade Reports Final grade reports are mailed to enrolled students at the end of each semester, or summer session if appropriate, at their home addresses.

Grade Protests A student wishing to protest a course grade must first attempt to resolve any disagreement with the instructor. In failing to reach a satisfactory resolution, the student may follow the procedures listed under "Student Academic Grievance Committee" in the *Student Handbook*. Grievances must be filed within 120 calendar days from the date printed on the grade report.

Final Examinations The standing of a student in his work at the end of a semester is based upon daily classwork, tests or other work, and the final examinations. Faculty members may excuse from the final examinations all students having the grade of A on the work of the course prior to the final examination, but for all other students written examinations are required in all subjects at the end of each semester, except in certain laboratory or practical courses in which final examinations are not deemed necessary by the department faculty.

Final examinations must be given on the dates and at the times designated in the final examination schedule.

Class Attendance Regular and punctual attendance at all class and laboratory sessions is the responsibility of each student. College work proceeds at such a pace that regular attendance is necessary in order for each student to obtain maximum benefits from instruction. All absences are matters to be resolved between the instructor and the student. In the event that a student finds it necessary to be absent from class, it is the student's responsibility to make up resulting deficiencies.

On the syllabus, the instructor shall inform the students of the attendance policy for that class. (Departments may establish uniform attendance policies for multiple section courses.) A student who incurs excessive absences may be dropped from a course by the instructor. If the student does not have sufficient withdrawal hours or if the student's absence that exceeds the professor's stated attendance policy occurs within the last five weeks of the semester, the action of dropping will result in the professor marking a final grade of F on the grade collection forms at the end of the semester.

Students desiring to withdraw from a class must secure a drop card from the Registrar's Office prior to terminating attendance. A student enrolled in the last five weeks of classes shall have final grades recorded.

Continuing Enrollment Policy The policy printed below is applicable to students who initially enroll at Clemson after May 15, 1992. Students who initially enrolled at Clemson before May 15, 1992 follow a modified version of the policy that is like the policy below with one exception: the modified version does not have a December (midyear) evaluation of academic standing.

The policy as printed below will be applicable to all students after August 15, 1995. At the end of any enrollment period, a notice of academic probation shall be placed on the grade report of an undergraduate student if his/her cumulative grade-point ratio is below 2.0, which is the minimum necessary for graduation.

In the event that a student is placed on academic probation, notification to that effect will be placed on the grade report for that session in which the student's academic deficiency occurred and for each session the student remains on probation. The student who clears probation by returning to the graduating academic requirement (2.0) will have notice to that effect placed on the grade report for that session. No notation concerning probation is placed on the student's permanent record.

A student on academic probation will be suspended or dismissed at the end of either fall semester or spring semester if his/her cumulative grade-point ratio is below the minimum cumulative grade-point ratio (MCGPR). Students entering Clemson University for the first time will not be subject to suspension until the student has attempted coursework at Clemson for two semesters; that is, fall and spring semesters (not necessarily consecutive enrollment). The minimum cumulative grade-point ratio is 2.0 for students with credit levels greater than or equal to 95 hours. For students with credit levels less than 95 hours, the MCGPR is given in the table below. CL in the table is the student's credit level, based on all credits taken at Clemson, plus any advanced standing received from transfer credits and credits based on approved examination programs.

CL	MCGPR	CL	MCGPR	CL	MCGPR	CL	MCGPR
16	1.28	36	1.68	56	1.85	76	1.94
17	1.31	37	1.69	57	1.85	77	1.94
18	1.35	38	1.70	58	1.86	78	1.94
19	1.37	39	1.72	59	1.86	79	1.95
20	1.40	40	1.73	60	1.87	80	1.95
21	1.43	41	1.74	61	1.88	81	1.95
22	1.45	42	1.75	62	1.88	82	1.96
23	1.47	43	1.75	63	1.89	83	1.96
24	1.50	44	1.76	64	1.89	84	1.96
25	1.52	45	1.77	65	1.89	85	1.97
26	1.53	46	1.78	66	1.90	86	1.97
27	1.55	47	1.79	67	1.90	87	1.97
28	1.57	48	1.79	68	1.91	88	1.97
29	1.59	49	1.80	69	1.91	89	1.98
30	1.60	50	1.81	70	1.92	90	1.98
31	1.62	51	1.82	71	1.92	91	1.98
32	1.63	52	1.82	72	1.92	92	1.99
33	1.64	53	1.83	73	1.93	93	1.99
34	1.66	54	1.84	74	1.93	94	1.99
35	1.67	55	1.84	75	1.93	95	2.00
						95+	2.00

The values in this table are based on the following formula:

$$MCGPR = 2.25 \times (CL / (CL + 12))$$

A student on probation who passes at least 12 semester credit hours and earns a 2.2 semester grade-point ratio on all hours attempted in the most recent semester (fall or spring) is permitted to continue enrollment on probation even though his/her cumulative grade-point ratio is below the required minimum grade-point ratio, defined above.

A student's first failure to qualify for continued enrollment will subject him/her to suspension from the University for the next fall or spring semester. Notice of academic suspension will appear on the permanent record.

Students subject to suspension or dismissal may appeal to the Appeals Committee on Continuing Enrollment at the end of any term of enrollment.

An appeal must include a complete explanation for the student's poor academic performance. To the extent possible, verifiable documentation should also be included. Appeals will be granted only in the most exceptional cases and a student will be allowed to continue due to appeal only once prior to dismissal.

Students subject to suspension will be permitted to enroll in summer school and may have their regular enrollment reinstated immediately if the summer school work brings their cumulative grade-point ratio above the minimum cumulative grade-point ratio.

Upon enrolling after suspension, a subsequent failure to meet the requirements for continued enrollment before clearing probation will result in dismissal from the university, and notice of dismissal will appear on the permanent record.

A student who has been dismissed may file a petition for readmission with the Appeals Committee on Continuing Enrollment after one calendar year. If this petition is denied, the student may file subsequent petitions for readmission after any intervening term of enrollment. Dismissed students who are readmitted and then again fail to meet the requirements for continuing enrollment will be dismissed and may not appeal to continue.

Academic Renewal The student who has not enrolled for a period of two or more academic years may apply to the Appeals Committee on Continuing Enrollment for readmission under special conditions known as academic renewal. Under these conditions, the previous credits attempted and quality-point deficit will not constitute a liability in a new grade-point computation. However, no credits passed or their attending quality points will be available to the student for a degree at Clemson. The previous record will appear on the permanent record as well as the notation of readmission under the policy of academic renewal.

Grade-Point Ratio In calculating a student's grade-point ratio, the total number of grade points accumulated by the student is divided by the total number of credit hours attempted at Clemson during the semester, session, or other period for which the grade-point ratio is calculated. For each credit hour the student receives grade points as follows: A—4, B—3, C—2, D—1. No grade points are assigned for grades of F, I, P, or W.

Dropping Classwork A subject dropped after the first four weeks of classwork and prior to the last five weeks is recorded as W—Withdrew.

Withdrawal from the University A student may withdraw from the University subject to the restrictions in the section on W—Withdraw. Students

who exceed these restrictions shall have final grades recorded. Any variance from the restrictions must be approved by the provost or the provost's designee and must be requested within 120 calendar days from the date printed on the grade report. The student must document the circumstances supporting the request.

Classification All new students are classified as freshmen unless they have attended another college prior to entrance. Students who have completed college work elsewhere will be classified on the basis of semester hours accepted at Clemson rather than the amount of work presented. In order to be classified as a member of any class other than freshman, students must meet the credit-hour requirements indicated below:

Sophomore—30 credit hours
Junior—60 credit hours
Senior—95 credit hours

Course Prerequisites Prerequisites for individual courses are enumerated under the course listings in the Courses of Instruction. In addition to these requirements, colleges and departments may also establish other standards as conditions for enrollment. In the College of Engineering a grade-point ratio of 1.8 or higher is required for registration in all engineering courses numbered 300 or higher. For undergraduate students who enter Clemson after May 15, 1983, the College of Engineering will require a cumulative grade-point ratio of 2.0 or higher for registration in all engineering courses numbered 300 or higher. In the Department of Electrical and Computer Engineering, a student is allowed to enroll in a departmental course, excluding E C E 307, 308, 309, and 310 only when all prerequisites for that course have been passed with a grade of C or higher. In the College of Nursing, a grade-point ratio of 2.0 or higher is required for registration in all nursing courses numbered 300 or higher. The College of Education requires a cumulative grade-point ratio of 1.8 or higher to enroll in 300-level courses and a cumulative grade-point ratio of 2.0 for 400-level courses. Directed teaching and teaching methods courses require a minimum cumulative grade-point ratio of 2.0.

Auditing Policies Qualified students may audit courses upon the written approval of the instructor. Auditors are under no obligation of regular attendance, preparation, recitation, or examination and receive no credit. Participation in classroom discussion and laboratory exercises by auditors is at the discretion of the instructor. A student who has previously audited a course is ineligible for credit by examination.

Undergraduate and graduate students enrolled in 12 or more hours may audit courses at no additional charge. Others interested in auditing courses should verify their eligibility through the Registrar's Office.

Academic Advising Each student is assigned to an academic adviser in his/her major area. It is the responsibility of the student to consult with the adviser during preregistration and to obtain the adviser's signature for adding and dropping courses. The adviser will assist the student in scheduling courses so as to fulfill the requirements of the degree program. Nevertheless, it is the responsibility of the student to fulfill the relevant requirements of the degree. Advisers also maintain files on individual advisees to assist in

academic planning.

Academic Records The student's permanent academic record is maintained in the Registrar's Office and contains personal identifying information, grades, and credits. Where appropriate, statements of a corrective nature, withdrawals, suspension for failure to meet academic standards, suspension for disciplinary reasons, and graduation data are added. It is a historical record of the student's academic progress.

STUDENT ACADEMIC GRIEVANCE COMMITTEE

I. General

The Academic Grievance Committee hears all grievances involving the following: (a) allegations of undergraduate student academic dishonesty; (b) allegations by undergraduate students against a faculty or staff member of discrimination in academics on the basis of race, color, national origin, sex, age, religion, handicap, or veterans status (except in those cases where the grievance involves student employment); (c) grievances of a personal or professional nature involving an individual undergraduate student and a faculty member; and (d) claims by undergraduate students concerning the inequitability of final grades. In all unresolved cases, the committee makes its recommendations to the President through the Provost. All proceeding of the committee are confidential. (For possible grievances arising from the inability to understand teachers whose first language is not English, the student must follow the English Fluency Policy referenced in *Student Handbook*.)

The Academic Grievance Committee is composed of nineteen members as follows:

a. one member of the faculty; three members, each from a different college, appointed each year for three-year terms by the respective college deans in collegiate rotation. Term of service commences with fall semester registration;

b. nine undergraduate students, nominated by the student body president, approved by the Student Senate and appointed by the Provost for one-year terms. Nominations should be made in the spring semester. Term of service commences with fall semester registration. No more than two students shall be appointed from any one college;

c. a representative of the Office of Student Development;

d. the Senior Vice Provost and Dean of Undergraduate Studies shall appoint the chairperson from those faculty members in their final year of service.

II. Academic Dishonesty

A. General

1. Academic dishonesty includes giving, receiving or using unauthorized aid on any academic work.

2. Plagiarism, a form of academic dishonesty, includes the copying of language, structure or ideas of another and attributing the work to one's own efforts.

3. All academic work submitted for grading contains an implicit pledge and may contain, at the request of the instructor, an explicit pledge by the student that no unauthorized aid has been received.

4. Academic dishonesty includes attempts to copy, edit or delete computer files that belong to another person without the permission of the file owner, account owner or file number owner.

B. Penalties

1. A student guilty of the first offense of academic dishonesty will receive as a maximum penalty a grade of F for the course.

2. A student guilty of the second offense of academic dishonesty will receive a grade of F for the course, will be suspended for one or more semesters and may be permanently dismissed. Suspension or dismissal requires approval of the President of the University.

C. Procedures

1. Academic honesty is the individual responsibility of each student. Students should report violations of this policy either to the faculty member of the affected course or to a department head or dean in the course area or to the student's academic adviser.

2. When, in the opinion of a faculty member, a student has committed an act of academic dishonesty, the following procedure must be followed:

a. The faculty member will inform each involved student in private of the nature of the alleged charge of academic dishonesty and will subsequently request in writing that the department head verify from the registrar the incident's being a first offense.

b. When this information has been received, the faculty member will notify the student in writing of the charge of academic dishonesty and the penalty recommended by the faculty member and approved by the head of the department in which the course is taught. The notification will further state that if the student regards the charge as unfair, the student has 14 calendar days from the date of receipt of notice to file a grievance with the Academic Grievance Committee (see below).

c. If no grievance is filed by the student, the faculty member will forward copies of the written notification to the dean of the college and to the registrar.

III. Rules and Procedures for Academic Dishonesty Grievances

1. Any student filing a grievance must first attempt to resolve it by consulting with the involved faculty member for resolution. In the event no resolution is reached, the student shall consult serially with the department head and dean of the faculty member, who shall hear the grievance and act as mediators. The dean, department head, faculty member and student shall make every effort to reach a solution.

2. If the grievance remains unresolved, the student may bring a written statement detailing the grievance before the Academic Grievance Committee. The student must report to the Office of Undergraduate Academic Services and secure a checklist form which the student will use to document the following: (a) the dates of those consultations described in Procedure 1, above, (b) the names of those persons consulted, and (c) the signature of the collegiate dean attesting that no resolution could be reached. Both the written statement and the checklist form must be delivered to the Office of Undergraduate Academic Services within 14 calendar days from the date of receipt of a written charge made by the faculty member. The Office of Undergraduate Academic Services will retain the original documents, forward a copy of the grievance to the chairperson of the Academic Grievance

Committee, and will also forward proper notification of the filed grievance to the Office of Records and Registration. The failure of a student to file a grievance within the 14 calendar-day period will cause him/her to forfeit his/her right to file a grievance under this procedure.

3. The documents referred to in Procedure 2, shall be delivered to the chairperson of the Academic Grievance Committee. The chairperson shall, upon receipt of the documents, appoint a subcommittee consisting of a chairperson who is a faculty or staff member of the committee and at least two other committee members, including at least one student, to investigate the grievance. If possible, the subcommittee shall include members who are not in the same college as the grievant.

4. The committee members appointed by the chairperson will constitute the subcommittee to investigate the grievance. A minimum of three subcommittee members, including at least one student member, must be present for the subcommittee to conduct the hearing described in Procedure 7.

5. The subcommittee to investigate the grievance will attempt to gather all information pertinent to the grievance in separate meetings with the individuals who give information concerning the grievance. However, after the separate meetings have been held, the subcommittee may question the student and faculty member simultaneously in one meeting. Such a joint meeting will be held only if the subcommittee deems it necessary for clarifying the facts.

6. The Academic Grievance Committee will, to the greatest extent possible, handle each case in a confidential manner.

7. The hearing on the grievance will be informal and shall be closed to the public. The chairperson shall take whatever action is necessary to ensure an equitable, orderly and expeditious hearing. Minutes of the meeting shall be taken, and all parties to the grievances shall be given an opportunity to be heard. Each party is responsible for having present at the hearing all witnesses that he/she wishes to speak on his or her behalf. In addition, the chairperson may request the presence of any other person who can supply information pertinent to the grievance. Witnesses shall not be present during the hearing proceedings except when they are called to speak before the committee. The parties shall be permitted to question all individuals who are heard by the committee. If any witness is unable to be present at the hearing, the chairperson may, at his/her discretion, accept a written statement from that witness to be presented at the hearing. The parties shall be accorded the right to assistance of counsel of their own choice; however, counsel shall not be permitted to participate actively in the proceedings.

8. Upon conclusion of the hearing, the subcommittee shall reach, by majority vote, a posed solution to the grievance. The subcommittee chairperson shall then formulate the findings in writing and seek to obtain from the parties involved in the grievance signed acceptance for a recommended solution to the grievance. If all parties to the grievance accept the solution posed by the subcommittee, the matter of the grievance will be considered closed when the solution has been implemented. Copies of the written findings and recommend solution will be forwarded by the subcommittee chairperson to all parties to the grievance for acceptance via return receipted certified mail. Each party will be asked to indicate acceptance of the posed

solution by signing and returning the letter within 14 calendar days of its date. Failure to respond within 14 calendar days will constitute acceptance. Proper notification of the solution arrived at by the Academic Grievance Committee will then be mailed by the subcommittee chairperson to the Office of Records and Registration, faculty member, department head of the student's major department, department head and dean of the department and college where the course is taught, and Director of Undergraduate Academic Services.

9. If, after the conclusion of the hearing on the grievance, the chairperson cannot secure acceptance of the posed solution, the grievance shall be referred to the President of the University via the Provost with the committee's recommended solution to the grievance along with all supporting evidence previously submitted to the Academic Grievance Committee. When grievances are referred in this manner, the President, on behalf of the University, shall make the final decision on the solution to the grievance and will then notify the Office of Records and Registration, faculty member, department head of the student's major department, department head and dean of the department and college where the course is taught, and Director of Undergraduate Academic Services of the University's final decision.

10. The chairperson shall keep in confidence all records pertinent to each grievance and pass these records to the Office of the Provost for filing. Records shall be available to succeeding chairpersons of the Academic Grievance Committee.

11. The Academic Grievance Committee shall make every reasonable effort to resolve every grievance presented to it by the end of the semester in which each grievance is received.

12. These procedures can be changed by the Commission on Undergraduate Studies. Such changes shall not affect any case under consideration at the time of the change. Notification of any changes to the procedures shall be given to the President of the University via the Academic Council.

IV. Rules and Procedures for Grievances Other Than Academic Dishonesty Grievances

1. Any student filing a grievance must first attempt to resolve it by consulting with the involved faculty or staff member for resolution. In the event no resolution is reached, the student shall consult serially with the department head and dean of the faculty member, or the immediate superior of the staff member, who shall hear the grievance and act as mediators. The dean, department head or immediate staff superior, faculty or staff member and student shall make every effort to reach a solution.

2. If the grievance remains unresolved, the student may bring a written statement detailing the grievance before the Academic Grievance Committee. The student must report to the Office of Undergraduate Academic Services and secure a checklist form which the student will use to document the following: (a) the dates of those consultations described in Procedure 1, above, (b) the names of those persons consulted, and (c) the signature of the collegiate dean attesting that no resolution could be reached. Both the written statement and the checklist form must be delivered to the Office of Undergraduate Services within 90 calendar days (exclusive of summer vacation) from the date the student alleges to have been aggrieved; or, in a case involving a protest of a final grade, the grievances must be filed

within 90 calendar days (exclusive of summer vacation) from the date printed on the grade report for the term in which the student alleges that an inequitable grade was recorded. The Office of Undergraduate Academic Services will retain the original documents and forward a copy of the grievance to the chairperson of the Academic Grievance Committee. In a case involving a protest of final grade, the office of Undergraduate Academic Services will notify the Office of Records and Registration of the filed grievance. The failure of a student to file a grievance within the 90-day period will cause him/her to forfeit his/her right to file a grievance under this procedure.

3. The documents referred to in Procedure 2, shall be delivered to the chairperson of the Academic Grievance Committee. The chairperson shall, upon receipt of the documents, appoint a subcommittee consisting of a chairperson who is a faculty or staff member of the committee and at least two other committee members, including at least one student, to investigate the grievance. If possible, the subcommittee shall include members who are not in the same college as the grievant.

4. The committee members appointed by the chairperson will constitute the subcommittee to investigate the grievance. A minimum of three subcommittee members, including at least one student member, must be present for the subcommittee to conduct the hearing described in Procedure 7.

5. The subcommittee to investigate the grievance will attempt to gather all information pertinent to the grievance in separate meetings with the individuals who give information concerning the grievance. However, after the separate meetings have been held, the subcommittee may question the student and faculty or staff member simultaneously in one meeting. Such a joint meeting will be held only if the subcommittee deems it necessary for clarifying the facts.

6. The Academic Grievance Committee will, to the greatest extent possible, handle each case in a confidential matter.

7. The hearing on the grievance will be informal and shall be closed to the public. The chairperson shall take whatever action is necessary to ensure an equitable, orderly and expeditious hearing. Minutes of the meeting shall be taken, and all parties to the grievance shall be given an opportunity to be heard. Each party is responsible for having present at the hearing all witnesses that he/she wishes to speak on his/her behalf. In addition, the chairperson may request the presence of any other person who can supply information pertinent to the grievance. Witnesses shall not be present during the hearing proceedings except when they are called to speak before the committee. The parties shall be permitted to question all individuals who are heard by the committee. If any witness is unable to be present at the hearing, the chairperson may, at his/her discretion, accept a written statement from that witness to be presented at the hearing. The parties shall be accorded the right to assistance of counsel of their own choice; however, counsel shall not be permitted to participate actively in the proceedings.

8. Upon conclusion of the hearing, the subcommittee shall reach, by majority vote, a posed solution to the grievance. The subcommittee chairperson shall then formulate the findings in writing and seek to obtain

from the parties involved in the grievance signed acceptance for a recommended solution to the grievance. If all parties to the grievance accept the solution posed by the subcommittee, the matter of the grievance will be considered closed when the solution has been implemented. Copies of the written findings and recommended solution will be forwarded by the subcommittee chairperson to all parties to the grievance for acceptance via return receipted certified mail. Each party will be asked to indicate acceptance of the posed solution by signing and returning the letter within 14 calendar days of its date. Failure to respond within 14 calendar days will constitute acceptance. Proper notification of the solution arrived at by the Academic Grievance Committee will then be mailed by the subcommittee chairperson to the involved faculty or staff member, department head of the faculty member or immediate superior of staff member, the involved collegiate dean, and Director of Undergraduate Academic Services. In a case involving a protest of a final grade, the subcommittee chairperson will also notify the Office of Records and Registration of the solution arrived at by the Academic Grievance Committee.

9. If, after the conclusion of the hearing on the grievance, the chairperson cannot secure acceptance of the posed solution, the grievance shall be referred to the President of the University via the Provost with the committee's recommended solution to the grievance along with all supporting evidence previously submitted to the Academic Grievance Committee. When grievances are referred in this manner, the President, on behalf of the University, shall make the final decision on the solution to the grievance and will then notify the involved faculty or staff member, department head of the involved faculty member or immediate superior of the staff member, involved collegiate dean, and Director of Undergraduate Academic Services of the University's final decision. In a case involving a protest of a final grade, the President will also notify the Office of Records and Registration of the University's final decision.

10. The chairperson shall keep in confidence all records pertinent to each grievance and pass these records to the Office of the Provost for filing. Records shall be available to succeeding chairpersons of the Academic Grievance Committee.

11. The Academic Grievance Committee shall make every reasonable effort to resolve every grievance presented to it by the end of the semester in which each grievance is received.

12. These procedures can be changed by the Commission on Undergraduate Studies. Such changes shall not affect any case under consideration at the time of the change. Notification of any changes to the procedure shall be given to the President of the University via the Academic Council.

ACADEMIC HONORS

Honor Graduates To be graduated with honors a student must have a minimum cumulative grade-point ratio as follows: cum laude—3.4, magna cum laude—3.7, and summa cum laude—3.9.

Honor Lists At the end of the fall and spring semesters, the following lists shall be compiled of undergraduate students who have achieved grade-point

ratios of 3.5 to 4.0 on a minimum of 12 semester hours, exclusive of Pass/Fail coursework.

Dean's List—3.5 to 3.99 grade-point ratio
President's List —4.0 grade-point ratio

Honors Program The Honors Program of Clemson University is known as Calhoun College, and students enrolled in honors work are called Calhoun Scholars. To enter or to remain in Calhoun College a student must have a cumulative grade-point ratio of 3.4. Admission to Calhoun College for incoming freshmen is by invitation, based primarily on SAT scores and high school academic records.

Calhoun College is under the direction of the chairperson of the Honors Program Committee, a group comprising faculty members from each college. The official *Calhoun College Handbook* is available in the chairperson's office, 320 Brackett Hall.

Students graduating in the Calhoun College program will have the fact indicated on their diplomas.

Honors and Awards The University offers a number of awards for outstanding achievement in specific fields and endeavors. Recipients are chosen by selection committees and are announced at the annual Honors and Awards Day program or other appropriate ceremonies. Detailed information relating to such awards is available in the offices of the academic deans and department heads.

GRADUATION REQUIREMENTS

A candidate for an undergraduate degree is a student who has turned in a completed diploma application by the deadline prescribed in the University Calendar for a particular graduation date.

Residence Requirement In order to qualify for an undergraduate degree, a student must complete from Clemson a minimum of 30 of the last 36 credits presented for the degree.

Make-up of I's Received in Last Semester A candidate for a degree who in the semester immediately prior to graduation receives one or more grades of I shall have an opportunity of removing the unsatisfactory grades provided the final grades are received in the Office of Admissions and Registration by the time grades for candidates for graduation are due.

A candidate who qualifies for graduation under this regulation will be awarded his/her degree on the regular date for the award of degrees.

Special Requirements A cumulative grade-point ratio of 2.0 is required for graduation. Candidates for degrees are required to apply for their diplomas within three weeks following the opening of the final semester or the opening of the summer session prior to the date the degrees are to be awarded. These applications should be filled out in the Office of Admissions and Registration on the regular blanks provided.

All work for a degree must be completed, all financial settlements made, and all government property and library books returned by 5 p.m. on the Tuesday preceding graduation.

Credit Limitation If all work toward a degree is not completed within six years after entrance, the student may be required to take additional courses.

Programs and Degrees

Clemson University offers seventy-three undergraduate degree programs under the colleges of Agricultural Sciences, Architecture, Commerce and Industry, Education, Engineering, Forest and Recreation Resources, Liberal Arts, Nursing, and Sciences.

BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN PREPROFESSIONAL STUDIES

Clemson University will award the degree of Bachelor of Arts or Bachelor of Science in Preprofessional Studies to a student who is bypassing the bachelors degree while pursuing an advanced degree. The student must have also satisfactorily completed three years of undergraduate work in an appropriate curriculum and the first year of work in an accredited medical, dental, veterinary, law, or other accredited, professional, postgraduate school, provided the student fulfills the requirements for the three-year program as follows and the other specified conditions are met.

1. At least two of the three years of preprofessional work, including the third year, must be taken in residence at this University.
2. A minimum of three years of undergraduate work (i.e., preprofessional school credit) must be presented.
3. Normal progress must have been made toward fulfilling the degree requirements of the curriculum in which the student is enrolled at Clemson.
4. The student applying for the Bachelor of Arts or Bachelor of Science in Preprofessional Studies must be recommended by the college at Clemson in which the curriculum that he/she is majoring as a Clemson student is located or by the college in which three years of normal progress toward a degree can be identified.
5. If the combination of preprofessional work taken and the work in the first year of professional school is equivalent to that which is required in some other bachelor's degree program at Clemson, the college concerned may recommend the other bachelor's degree.

The above requirements and conditions became effective July 1, 1974, and will apply to all students who satisfy these requirements and conditions after that date.

A Clemson student having left the University before receiving the bachelor's degree (prior to July 1, 1974), and having enrolled immediately in an accredited, professional, postgraduate school may apply for a bachelor's degree from Clemson and have his/her application considered on an individual basis. The college(s) at Clemson considering the application are authorized to examine the student's entire record in both preprofessional and professional studies and exercise their own judgment concerning the three-year requirement for Preprofessional Studies.

SECOND BACCALAUREATE DEGREE

To complete a second baccalaureate degree, a student must complete a minimum of 30 semester hours at Clemson in addition to the greater number of hours required for either degree and satisfy all course and grade requirements for the second degree.

DOUBLE MAJOR

A student in a Bachelor of Arts degree program may be awarded a single baccalaureate degree with a double major. The two majors may be within a single college or may involve two colleges, but are limited to Bachelor of Arts degree programs.

GRADUATE DEGREES

Programs leading to graduate degrees from Clemson University are available in nine colleges—Agricultural Sciences, Architecture, Commerce and Industry, Education, Engineering, Forest and Recreation Resources, Liberal Arts, Nursing, and Sciences.

One hundred and eight graduate degree programs are offered. The degrees of Doctor of Philosophy; Doctor of Education; Education Specialist; Master of Arts; Master of Science; Master of Agricultural Education; Master of Agriculture; Master of Architecture; Master of Construction Science and Management; Master of Business Administration; Master of City and Regional Planning; Master of Education; Master of Engineering; Master of Fine Arts; Master of Forest Resources; Master of Human Resources Development; Master of Industrial Education; Master of Nutritional Sciences; Master of Parks, Recreation, and Tourism Management; and Master of Professional Accountancy are awarded to students who satisfactorily complete prescribed graduate programs.

For further information concerning advanced degrees see *The Graduate School Announcements,* which may be obtained from the Office of the Dean of the Graduate School.

DEGREE PROGRAMS AND MINORS

1. Numbers following the minors indicate the college offering the minor.
2. Asterisks indicate the minors that are not accepted for the major.
3. The Environmental Science minor (10) is interdisciplinary.
4. Cluster minor, Group II Administration is not acceptable for the BS in Accounting, Economics, Financial Management, Industrial Management, Management, and Marketing.

MINORS		Accounting (3)	Adult/Extension Education (1)	Agricultural Business Management (1)	Agronomy (1)	Aquaculture, Fisheries & Wildlife Biology (1)	Beef Production (1)	Biochemistry (9)	Biological Sciences (9)	Chemistry (9)	Cluster (7)	Communication (7)	Computer Science (9)	Economics (3)	English (7)	Entomology (1)	Environmental Science (10)	Fine Arts (7)
College of Agricultural Sciences (1)																		
Agricultural and Applied Economics	BS													*				
Agricultural Economics																		
Community and Rural Development																		
Agricultural Education	BS																	
Agricultural Engineering[1]	BS																	
Agricultural Mechanization and Business	BS																	
Agronomy	BS				*													
Animal Industries	BS																	
Animal, Dairy and Veterinary Sciences																		
Poultry Science																		
Aquaculture, Fisheries, and Wildlife Biology	BS					*												
Entomology	BS															*		
Food Science	BS																	
Horticulture	BS																	
Turfgrass																		
Packaging Science	BS																	
Plant Pathology	BS																	
College of Architecture (2)																		
Construction Science and Management	BS	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
Design	BA, BS	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Fine Arts	BFA	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Landscape Architecture	BLA	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
College of Commerce and Industry (3)																		
Accounting	BS	*																
Economics	BA, BS													*				
Financial Management	BS																	
Industrial Management	BS																	
Management	BS																	
Marketing	BS																	
Textile Chemistry	BS																	
Textile Management	BS																	
Textile Science	BS																	
College of Education (4)																		
Early Childhood Education	BA																	
Elementary Education	BA																	
Graphic Communications	BS																	
Industrial Education	BS																	
Mathematics Teaching	BS																	
Science Teaching	BS																	
Biological Sciences									*									
Earth Science																		
Physical Sciences																		

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	MINORS	Accounting (3)	Adult/Extension Education (1)	Agricultural Business Management (1)	Agronomy (1)	Aquaculture, Fisheries & Wildlife Biology (1)	Beef Production (1)	Biochemistry (9)	Biological Sciences (9)	Chemistry (9)	Cluster (7)	Communication (7)	Computer Science (9)	Economics (3)	English (7)	Entomology (1)	Environmental Science (10)	Fine Arts (7)
College of Education (4)																		
Secondary Education	BA																	
English															*			
History and Geography																		
Mathematics																		
Modern Languages																		
Political Science																		
Psychology and Sociology																		
Special Education	BA																	
College of Engineering (5)																		
Agricultural Engineering[1]	BS																	
Ceramic Engineering	BS																	
Chemical Engineering	BS																	
Civil Engineering	BS																	
Computer Engineering	BS																	
Electrical Engineering	BS																	
Engineering Analysis	BS																	
Industrial Engineering	BS																	
Mechanical Engineering	BS																	
College of Forest and Recreation Resources (6)																		
Forest Resource Management	BS																	
Forest Products	BS																	
Parks, Recreation, and Tourism Management	BS																	
College of Liberal Arts (7)																		
English	BA		*	*	*	*	*								*	*		
History	BA		*	*	*	*	*									*		
Language and International Trade	BA	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Modern Languages	BA		*	*	*	*	*									*		
Philosophy	BA		*	*	*	*	*									*		
Political Science	BA		*	*	*	*										*		
Psychology	BA		*	*	*	*	*									*		
Sociology	BA		*	*	*	*	*									*		
College of Nursing (8)																		
Health Science	BS																	
Nursing	BS																	
College of Sciences (9)																		
Biochemistry	BS							*										
Biological Sciences	BA, BS								*									
Chemistry	BA, BS									*								
Computer Information Systems	BS												*					
Computer Science	BA, BS												*					
Geology	BA, BS																	
Mathematical Sciences[2]	BA, BS		*	*	*	*	*					*						
Medical Technology	BS																	
Microbiology	BS																	
Physics	BA, BS																	
Prepharmacy	Nondegree																	
Prephysical Therapy	Nondegree																	

[1]Jointly administered by the College of Agricultural Sciences and the College of Engineering.
[2]For the Bachelor of Arts only.

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MINORS

A minor consists of at least 15 semester credits, with no fewer than 9 credits at the 300 level or higher. Courses used to fulfill general education requirements, options, and electives may be counted toward the minor. However, a student cannot major and minor in the same field. A minor may be declared with the written approval of the major adviser. The adviser shall contact the department offering the minor.

A minor may be acquired with either the Bachelor of Arts or the Bachelor of Science degree. The minor will be posted to the student's transcript but not on the diploma. Specific requirements for each minor are detailed below.

Accounting A minor concentration in Accounting requires ACCT 201, 202, 301, 302, and 6 additional credits in accounting courses numbered higher than 301. (Credit may not be received for both ACCT 303 and 307.)

Adult/Extension Education A minor in Adult/Extension Education requires AG ED 403, 440, 445, and 6 additional credits selected from the following: AG ED 407, 428, 432, 450, 482, PRTM 308.

Agricultural Business Management A minor in Agricultural Business Management requires AP EC 302, 309, 319 and at least two courses selected from AP EC 308, 351, 402, 409, 433, 452, 456, 460.

Agronomy A minor in Agronomy requires AGRIC 104, AGRON 202, and 9 or more credits at the 300 level or higher.

Aquaculture, Fisheries, and Wildlife Biology A minor in Aquaculture, Fisheries, and Wildlife Biology requires W F B 350 and 12 credits selected from the following: W F B 306, 307, 412, 414, 416, 450, 451, 452, 460, 462, 469, 493, 499.

Beef Production A minor concentration in Beef Production requires ADVSC 202, 301, 412 and 8 credits from the following: ADVSC 205, 309, 310, 390, 405.

Biochemistry A minor concentration in Biochemistry requires BIOCH 301, 423 or 431, 432, 433, 434 (11 credits), plus any other biochemistry courses at the 300 level or above, for an additional 4 credits.

Biological Sciences A minor concentration in Biological Sciences requires 15 credits and must include either BIOSC 302 or 303, 304 or 305 (or both); remaining credits must be selected from biochemistry, biological sciences, botany, genetics, or zoology courses numbered 300 or higher.

Chemistry A minor concentration in Chemistry requires CH 101, 102, and 15 additional credits in chemistry, at least 9 of which must be at the 300 or 400 level, with the courses to be selected in consultation with the Department of Chemistry.

Cluster The Cluster minor concentration is designed to allow students a somewhat wider choice of course materials than is possible with the conventional subject-matter minor. The general requirement for the Cluster minor is 15 credits in courses numbered higher than 300, except where noted differently, chosen according to one of the plans listed below. Courses within the student's major area may not be included in the Cluster minor.

Group I Social Sciences—anthropology, economics, geography, history,

political science, psychology, sociology.

Group II Administration—accounting, economics, finance, law, management, marketing.

Group III Life Sciences[1]—biochemistry, biological science, botany, genetics, microbiology, zoology.

Group IV Physical Sciences[1]—chemistry, geology, physics.

Communications A minor concentration in Communications requires 18 credits distributed as follows:

General Communications Option ENGL 231, 312, and either SPCH 360 or 361, PHIL 102, and 6 elective credits.

Advertising Option AP EC 351, ENGL 231 or 304, G C 104, PSYCH 330, and 6 elective credits.

Commerce Option AP EC 351 or IN ED 496, ENGL 231 or 304, SPCH 360 or 361, MGT 301, and 6 elective credits.

Politics Option ENGL 312 and either SPCH 360 or 361, PO SC 341, 443, and 6 elective credits.

Elective credits are approved by the Head of the Department of English or his/her representative.

Computer Science A minor in Computer Science requires CP SC 102 or 210, 231, 340, plus at least 6 credits chosen from 300 level or higher computer science courses.

Economics A minor concentration in Economics requires ECON 314, 315, and 9 additional credits from economics courses numbered 300 or higher.

English A minor concentration in English requires 15 credits in English above the sophomore level, arranged as follows:

Group I ENGL 411.

Group II Three credits from ENGL 405, 406, 407, 408, 409, 410, 412, 413, 414, 415, 416, 417, 418.

Group III Three credits from ENGL 422, 423, 424, 425.

Group IV Six additional credits above the sophomore level, including at least 3 credits from the 400 level.

Department certification of proficiency in composition is required. (See discussion under major concentration in English.)

Entomology A minor in Entomology requires ENT 301 and 12 credits of any other entomology courses at the 300 level or higher.

Environmental Science A minor concentration in Environmental Science requires EN SC 200, 400, and 12 credits from the following groups:

Group I Science and engineering—At least 6 credits from these courses: AGRON 202, AGRON (AG E, E S E) 408, BIOSC 441, 443, CH 413, ENT (EN TOX) 430, E S E 401, 402, 430, 485, FOR 315.

Group II Economics and resource management—At least 3 credits from these courses: AP EC 403, AGRON 404, C R D 357, GEOG 101, 102, 103.

Group III History, political science, philosophy, psychology, and ethics —At

[1]No course in the 100 series is acceptable toward the Cluster minor and not more than two courses in the 200 series are acceptable.

least 3 credits from these courses: C R P 405, HIST 321, 322, 323, 491, HUM 305, PHIL 324, 325, PSYCH 355, S T S 300.

Fine Arts The minor concentration in Fine Arts requires HUM 301[1], 302[1] and 15 credits from the following courses, of which at least 9 credits must be earned in courses numbered 300 or higher, and no more than 9 credits in any discipline selected from the following: A A H (all courses), ART (all courses), ENGL 345, 346, 357, 445, 446, HUM 305, 306, 309, L S 190, MUSIC 151, 152, 205, 206, 210, 251, 252, 301, 305, 306, 311, 315, 316, 351, 352, 362, 363, 365, 421, 422, SPCH 369, SPCH (THEA) 363, THEA 279, 375, 376, 378.

Forest Products A minor in Forest Products requires 18 credits from the following: FOR 221, 315, 420, and a minimum of 9 credits, selected with a forestry faculty adviser's approval, from 300- and 400-level forestry courses.

Forest Resource Management A minor in Forest Resource Management requires either of the following:
1. Credits from the following: FOR 305, 310, 315, and a minimum of 6 credits, selected with a forestry faculty adviser's approval, from any forestry course (for a total of 15 credits).
2. A formal program of study developed by the student and forestry adviser, containing a minimum of 15 credits of forestry courses. Nine credits must be at the 300 level or higher.

Geography The Geography minor consists of GEOG 101, 102, or 103 plus 15 credits of geography at the 300 and 400 level. At least one 400-level geography course must be taken. One of the following courses may be taken as part of the 15-credit, upper-level requirements but may not be substituted for the required 400-level geography course: PRTM 401, R S (SOC) 401, 471.

Geology A minor concentration in Geology requires GEOL 101 and 15 additional credits drawn from 300- and 400-level geology courses; at least one 400-level course must be included.

Health Science A minor in Health Science requires HLTH 298 plus 12 additional credits drawn from the 300- and 400-level health courses; at least one 400-level course must be included.

History A minor concentration in History requires 15 credits in history at the 300 and 400 level. Three credits at the 400 level must be included.

Horse Production A minor concentration in Horse Production requires ADVSC 202, 301, 390, 401; 2 credits from ADVSC 108, 210, 306, 455; and 3 credits from ADVSC 253 and 255, 310, 452, 453.

Horticulture A minor concentration in Horticulture requires HORT 101 and 12 additional credits of horticulture courses (excluding HORT 271, 408, 471), 9 credits of which must be at the 300 level or higher.

International Politics A minor concentration in International Politics requires PO SC 105, 361 and 12 additional credits at the 300 or 400 level, of which at least 3 must be chosen from Group I below and at least 3 from Group II:

Group I Comparative Politics—PO SC 371, 373, 471, 472, 475, 476, 477.

[1]Students transferring from the College of Architecture may substitute CA DS 151-152 for HUM 301, 302.

Group II International Politics—PO SC 428, 457, 462, 463, 465.

With the approval of the Political Science department head, PO SC 310, 311, 379, and 468 may be applied to the requirements for the International Politics minor. Students majoring in Political Science cannot minor in International Politics.

Marketing A minor concentration in Marketing requires MKT 301 and 12 additional credits drawn from 300- or 400-level marketing courses.

Mathematical Sciences A minor concentration in Mathematical Sciences requires MTHSC 208 and 12 additional credits in mathematical sciences courses numbered 300 or higher.

Microbiology A minor concentration in Microbiology requires MICRO 305 and 11 additional credits drawn from 400-level microbiology courses.

Modern Languages A minor concentration in Modern Languages requires 15 credits in one modern language from courses at the 300 and 400 levels, including at least one course at the 400 level. In addition, a minor concentration in French requires FR 205.

Music[1] A minor concentration in Music requires MUSIC 151, 152, 205, 206, two credits in ensemble (MUSIC 361, 362, 363, 365, 366, 367, 368, 369) and 11 additional credits from these courses: MUSIC 210, 251, 252, 301, 305, 306, 311, 312, 315, 316, 351, 352, 421, 422. Two additional ensemble credits may be included.

Natural Resource Economics A minor in Natural Resource Economics requires AP EC 403 and C R D 357 and three courses selected from the following: AP EC 308, 352, 402, 425, 433, 452, AP EC (C R D) 412, R S (SOC) 401.

Philosophy A minor concentration in Philosophy requires 18 credits in philosophy. These 18 credits may include one 100-level philosophy course (PHIL 101, 102, or 103). At least one 3-credit course at the 400 level must be included.

Physics A minor concentration in Physics requires PHYS 122, 221 and 222, and 9 additional credits in physics courses at the 300 level or higher.

Plant Pathology A minor concentration in Plant Pathology requires PL PA 401 and 12 credits from the following: Any 300/400-level plant pathology courses, BIOSC 418, BOT 411, I P M 401, MICRO 305.

Political Science A minor concentration in Political Science requires PO SC 101 or 103 or 105 and 15 additional credits at the 300-400 level, 9 of which must be selected from three different fields of political science as follows:

American Government PO SC 403, 405, 432, 442.
Comparative Politics PO SC 371, 373, 471, 475, 476, 477.
International Politics PO SC 361, 428, 462, 463, 465.
Political Theory PO SC 351, 352, 453.
Public Policy/Public Administration PO SC 302, 321, 422.

At least one 400-level course must be included. No more than a total of 3 credits from PO SC 310, 311, and 312 may be applied to the requirements for a Political Science minor.

[1]Housed in the Department of Performing Arts.

Poultry Science A minor concentration in Poultry Science requires P S 201 and 12 additional credits from P S 101, 323, 355, 400, 402, 451, 453, 458, 460.

Psychology A minor concentration in Psychology requires PSYCH 201, and 205 or 210 (except for Sociology majors) and 15 credits from 300- and 400-level psychology courses. At least one 400-level course must be included.

Religion A minor concentration in Religion requires REL 101 plus 15 credits in religion courses numbered above 300, including at least one course numbered above 400. PHIL 303 and SOC 432 may be included in the minor, provided that they are not counted towards meeting requirements for a major in those fields.

Science and Technology in Society A minor in Science and Technology in Society requires S T S 300 plus 15 additional credits, at least six of which must be on the 400 level. No course that is used to meet the requirements of a disciplinary major may also be used to meet the Science and Technology in Society minor requirements. See adviser for list of approved courses.

Sociology A minor concentration in Sociology requires SOC 201 and 15 credits from sociology and rural sociology courses numbered 300 or higher. At least one 400-level course must be included.

Spanish-American Area Studies A minor concentration in Spanish-American Area Studies requires the equivalent of SPAN 202, plus 15 credits distributed as follows: 6 credits from HIST 340, 341, 342, 440; 6 credits from SPAN 305, 308, 311, 411; 3 credits from AGRIC 301, 401, ECON 410, PO SC 475.

Speech[1] A minor concentration in Speech requires SPCH 250 and 12 additional credits in speech.

Textiles A minor in Textiles requires 15 credits form the following: TEXT 201, 202, 460, and any other approved textile course such as TEXT 308, 314, 416, 420, 426, 428, 440, 470, 471, 472, 475, 476.

Theatre[1] The minor concentration in Theatre requires THEA 378 and 15 additional credits arranged as follows:

Group I	Dramatic Literature—At least 3 credits from these courses: ENGL 404, 410, 411, 430.
Group II	Production and Playwriting—9 credits from these courses: THEA (ENGL) 347, 447; THEA 375, 376, 377, 475, 476, 477.
Group III	Electives—3 additional credits from the 400-level courses listed above.

Women's Studies A minor concentration in Women's Studies requires 15 credits on the 300 and 400 level, distributed as follows:

Group I	6 credits: W S 301 and 498.
Group II	6 credits chosen from core courses: ENGL 380, 436, HIST 318, PSYCH 308, SOC 461, and any additional courses approved for Group II.
Group III	The final 3 credits may be earned by taking any approved Women's Studies minor course.

[1]Housed in the Department of Performing Arts.

Courses selected in Groups II and III must represent at least two disciplines. No course that is used to meet the requirements of a disciplinary major may also be used to meet the Women's Studies minor requirements. The courses for this minor are to be scheduled in consultation with the appropriate advisers. The Women's Studies adviser will provide all affected advisers with a list of approved courses prior to preregistration.

Writing A minor concentration in writing requires 15 credits as follows:

Business and Technical Option AP EC 351 or G C 104, CP SC 120, ENGL 304 or 314, 392, 490.

Journalism Option ENGL 231, 333, 334, 335; one of the following electives: AP EC 351, CP SC 120, G C 104, ENGL 217, 304, 312, 314, IN ED 496, PHIL 102, SPCH 250, 260, and any course approved by the Head of the Department of English.

Writing Pedagogy Option ENGL 312, 400, 401, 485; elective (3 credits), any 300- or 400-level writing course offered by the Department of English.

Creative Writing Options

Drama THEA (ENGL) 347, 447 (6 credits), ENGL 430, and one of the following electives: ENGL 312, 410, 411, THEA 378.

Fiction ENGL 345, 445 (6 credits), 432, and one of the following electives: ENGL 312, 418, 425, 426.

Poetry ENGL 346, 446 (6 credits), 431, and one of the following electives: ENGL 312, 413, 416, 417.

GENERAL EDUCATION REQUIREMENTS

An undergraduate student whose enrollment in a curriculum occurs after May 15, 1984, must fulfill the general education requirements in the catalog in effect at the time. A student who withdraws from the University and subsequently returns after May 15, 1984, will be required to satisfy the general education requirements. Any variation in curricular or general education requirements shall be considered under the substitution procedure.

The general education requirements in some curricula are more restrictive than the general requirements shown below.

A. Composition and Speaking Skills ..... 9 hours
   1. English 101, 102
   2. Three hours from English 231, 304, 312, 314, 316, 345, 346, 347; Speech 150, 250

B. Mathematics ..... 6 hours
   1. Six hours taken from any course in mathematical sciences and Experimental Statistics 301. (Exception: MTHSC 115, 116, 215, 216 may be used by Education majors only to satisfy this requirement.)

C. Science and Technology ..... 11 hours
   1. A two-semester sequence in the same physical or biological sciences, each including a laboratory
   2. At least an additional 3 hours in an applied science to be

selected from the following:
Any introductory physical or biological science, except the science selected to fulfill C 1 above
Agricultural Engineering—All courses except 471, 473
Agricultural Mechanization—All courses except 408, 472
Agriculture—All courses except 301, 401, H491, H492
Agronomy—All courses except 350, 406, 455
Animal, Dairy, and Veterinary Sciences—All courses except 205, 360, 390, 406, 422
Animal Physiology 301, 460
Anthropology 251
Architecture 425, 488
Astronomy 302, 303
Biochemistry 431
Biological Sciences 210, 222, 223, 241, 302, 303, 304, 305
Biology 109
Computer Science 101, 110, 120, 130
Construction Science and Management 201, 202, 203, 301, 302, 304, 403
Economics 405, 430
Education 458, 497
Engineering—All Engineering-designated courses or combination of courses that are 3 hours or more
Entomology—All courses except 461, 462, 468, 490
Environmental Science 200, 432, 471, 472
Experimental Statistics 301, 462
Food Science—All courses except 417, 418, 420, 421, 491
Forest Resources 205, 206, 221, 222, 251, 252, 253, 254, 255, 302, 305, 306, 308, 310, 312, 325, 403, 405, 409, 411, 412, 413, 415, 420, 424, 429, 430, 431, 432, 434, 436
Genetics—All courses
Geography 310
Geology 210, 220, 306, 400, 401, 402, 403, 405, 407, 408, 413
Graphic Communications 104, 444, 445, 446
Health—All courses
Horticulture—All courses except 304, 308, 407, 409, 416, 461, 462, 470, 471
Industrial Education 102, 202, 203, 204, 205, 208, 210, 240, 316, 320, 372, 412, 415, 418, 468
Management 302, 308, 320 , 322, 401, 419
Management Science 310, 413, 414
Mathematical Sciences 231, 301
Microbiology 100
Nursing 300, 304
Nutrition—All courses
Packaging Science—All courses
Parks, Recreation, and Tourism Management 203
Physics 240, 262, 355, 441
Plant Pathology—All courses
Poultry Science—All courses except 405, 406, 460, 471

Textile Chemistry 315, 316, 405, 406
Textile Management and Textile Science 175, 176, 201, 202, 308, 313, 314, 321, 322, 414, 426, 440, 460
Wildlife and Fisheries Biology—All courses except 490, 499
Zoology 456

F. Humanities ..... 6 hours
1. Three hours selected from sophomore literature courses (200 level only) or foreign language literature (300 level or higher)
2. Three hours selected from the following (excluding practica):
Art and Architectural History—All courses except 411, 412
English—All courses except 100, 101, 102, 111, 217, 231, 304, 312, 314, 316, 331, 333, 334, 335, 345, 346, 347, 450, 451, 452, 453, 485, 490, 495
French—All courses, 300 level or higher, except 305, 409
German—All courses, 300 level or higher, except 305, 411, 412
Humanities—All courses
Italian—All courses, 300 level or higher
Music 151, 152, 210, 251, 252, 301, 306, 311, 312, 315, 316
Philosophy—All courses
Religion—All courses
Russian—All courses, 300 level or higher
Spanish—All courses, 300 level or higher, except 305, 409, 411
Speech 340, 360, 361, 363, 365, 366, 369, 401
Theatre 210, 274, 375, 376, 378, 475, 476, 477
Visual Arts—All courses except 471, 472
Women's Studies 301, 498

G. Social Sciences ..... 6 hours
1. Six hours selected from the following:
Agricultural and Applied Economics—All courses except 426, 490
Anthropology—All courses except 251
Community and Rural Development 357, 361, 411, 412
Economics—All courses except 405, 430
Geography—All courses except 310
History—All courses
Political Science—All courses
Psychology—All courses
Rural Sociology 301, 303, 359, 371, 401, 403, 471, 495, 498
Science and Technology in Society 300
Sociology—All courses

38 hours

COLLEGE OF AGRICULTURAL SCIENCES

Knowledge and technical experience in the application of basic science and mathematics along with general education addresses the professional expertise needed in the agricultural industry. The College meets this demand by offering diverse curricula ranging from the study of diseases, to the design of environmentally compatible packages, to the management of turfgrass for golf courses, to the conservation of natural resources, to the production and marketing of food and fiber. Employment opportunities of over 48,000 positions annually exceed the supply of qualified graduates by one-third. It is a buyer's market for graduates with a bachelor, master, or doctoral degree.

The College of Agricultural Sciences offers twelve major undergraduate programs with six optional areas of study leading to a Bachelor of Science degree. These curricula include Agricultural and Applied Economics with options in Agricultural Economics and Community and Rural Development; Agricultural Education; Agricultural Engineering; Agricultural Mechanization and Business; Agronomy; Animal Industries with options in Animal, Dairy and Veterinary Sciences and Poultry Science; Aquaculture, Fisheries and Wildlife Biology; Entomology; Food Science; Horticulture with an option in Turfgrass; Packaging Science; and Plant Pathology.

MINORS

The various disciplines in Agricultural Sciences offer minors to students who wish to broaden their educational background and enhance their expertise. (See page 60 for minors.)

HONORS PROGRAM

Students with a cumulative grade-point ratio of 3.4 and above are urged to consider enrolling in the Honors Program. The College offers Honors designated courses and an opportunity to do a research project under the direction of an agricultural scientist. For more information contact the Honors Program Office in Brackett Hall.

SCHOLARSHIPS

A wide range of scholarships are available to students who are majoring in one of the agricultural disciplines. Applications for scholarships must be completed annually and returned to the Office of Student Financial Aid in order to be considered.

AGRICULTURAL AND APPLIED ECONOMICS

The Agricultural and Applied Economics major includes two curricula: (1) Agricultural Economics, and (2) Community and Rural Development.

AGRICULTURAL ECONOMICS

The curriculum in Agricultural Economics places emphasis on a strong background in economics with applications to agricultural and agriculturally-related businesses. Also included are courses in basic agricultural and biological sciences, liberal arts, and business. Students have twelve hours of free

electives that may be used for further individual specialization or to broaden the educational experience.

Employment opportunities open to graduates with an Agricultural Economics curriculum are many and diverse. These include sales and promotional work for a variety of businesses, management positions in the farm-loan departments of private banks or with cooperative farm credit agencies, public relations activities for various firms, market managers and directors, county agents, representatives of government agencies serving agriculture, and operators of numerous enterprises.

All students in the Agricultural Economics curriculum take a basic set of courses during their freshman and sophomore years. During the junior and senior years each student concentrates in a particular study area. Four study areas are available: (1) Agricultural Business, (2) Economics, (3) International Trade and Development, and (4) Real Estate. Each student should select one of the four areas by the end of the sophomore year.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Introduction to Animal Industries	3	AGRIC 104 Introduction to Plant Sciences	3
AGRIC 105 Agriculture and Society	3	AP EC 202 Agricultural Economics	3
ENGL 101 Composition I	3	CP SC 120 Intro. to Infor. Proc. Sys.	3
MTHSC 102 Intro. to Math. Analysis	3	ENGL 102 Composition II	3
Science Requirement[1]	4	Science Requirement[1]	4
	16		16

SOPHOMORE YEAR

AP EC 302 Economics of Farm Management	3	AP EC 308 Quantitative Applied Economics	3
ECON 212 Principles of Macroeconomics	3	AP EC 309 Economics of Agricultural Marketing	3
Accounting Requirement[2]	3	EX ST 301 Introductory Statistics	3
Humanities[3]	3	Accounting Requirement[2]	3
Literature Requirement[4]	3	Speech Requirement[5]	3
Elective	3	Elective	3
	18		18

JUNIOR YEAR

ECON 314 Intermediate Microeconomic Theory	3	ECON 302 Money and Banking	3
ENGL 304 Business Writing	3	or ECON 315 Intermediate Macroecon. Theory	3
or ENGL 314 Technical Writing	3	LAW 312 Commercial Law	3
EX ST 462 Statistics Applied to Economics	3	or LAW 322 Legal Environment of Business	3
R S 301 Rural Sociology	3	Social Science Requirement[7]	3
or R S (SOC) 359 The Community	3	Study Area[6]	6
Study Area[6]	3	Elective	3
	15		18

SENIOR YEAR

AGRON (AP EC) 426 Cropping Systems Analysis	3	AP EC 420 World Agricultural Trade	3
AP EC 402 Production Economics	3	AP EC 456 Prices	3
AP EC 452 Agricultural Policy	3	AP EC 460 Agricultural Finance	3
Study Area[6]	3	Study Area[6]	6
Elective	3		15
	15		

131 Total Semester Hours

[1] A two-semester sequence in the same physical or biological science, each including a laboratory.
[2] A two-semester sequence: ACCT 201 and 202 or 203 and 307.
[3] See Humanities Requirement 2 under General Education Requirements.
[4] ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[5] SPCH 250, 340, 364.
[6] A study area should be selected by the end of the sophomore year in consultation with adviser. Select 18 credits from one of the following.
Agricultural Business MGT 301, 307, MKT 301, and 9 credits from a department approved list. (See adviser.)
Economics ECON 430, MTHSC 207, 210, and 9 credits from a department approved list. (See adviser.)
International Trade and Development Six credits of AP EC 490 or 2 courses of the same foreign language, ECON 310 or 412, AGRIC 401, and 8 credits from a department approved list. (See adviser.)
Real Estate AP EC 313, FIN 307, 415, 417, and 6 credits from a department approved list. (See adviser.)
[7] GEOG 101, 102, 103, PO SC 101, 103, 105, 302, S T S 300.

COMMUNITY AND RURAL DEVELOPMENT

The Community and Rural Development curriculum is designed to provide students with knowledge to deal with local, national, and international development issues. Students learn about natural and human resources, and basic principles in several disciplines. Associations between natural resources and social, economic, and political institutions are studied. Students receive practical training, and internships are available to complement the coursework in this curriculum.

A bachelor's degree with a major in Community and Rural Development will qualify students for employment with local, state, regional, federal and international agencies; with utilities, cooperative-extension services, private businesses, research-consulting firms, and financial institutions. This major also provides an excellent background for professional or graduate study in several disciplines.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 105 Agriculture and Society	3	AGRIC 200 Agric. Application of Microcomp	3
ENGL 101 Composition I	3	ENGL 102 Composition II	3
GEOG 101 Introduction to Geography	3	MTHSC 102 Intro. to Math. Analysis	3
or GEOG 102 Human Geography	3	Humanities Requirement[2]	3
MTHSC 101 Finite Probability	3	Science Requirement[1]	4
Science Requirement[1]	4		16
	16		

SOPHOMORE YEAR

AG M 301 Soil and Water Conservation	3	ACCT 201 Principles of Accounting	3
or AGRON 202 Soils	4	ECON 212 Principles of Macroeconomics	3
AGRIC 301 International Agriculture	3	ENGL 231 Introduction to Journalism	3
AP EC 202 Agricultural Economics	3	PO SC 103 Intro. to Government and Politics	3
EX ST 301 Introductory Statistics	3	or PO SC 105 Intro. to International Politics	3
Literature Requirement[3]	3	R S 301 Rural Sociology	3
	15-16	SPCH 250 Public Speaking	3
			18

JUNIOR YEAR

ECON 314 Intermediate Microeconomics	3	AP EC 352 Public Finance	3
EX ST 462 Statistics Applied to Economics	3	C R D 357 Natural Resources Economics	3
RS (SOC) 359 The Community	3	R S (SOC) 401 Human Ecology	3
Social Science Requirement[4]	3	Commerce and Industry Requirement[5]	3
Specialization[8]	3	Specialization[8]	3
Elective	2	Elective	2
	17		17

SENIOR YEAR

C R D (AP EC) 411 Reg. Impact Analysis	2	AP EC 403 Land Economics	3
R S (SOC) 471 Demography	3	C R D (AP EC) 412 Spatial Competition and	
Advanced Social Science Requirement[6]	3	and Rural Development	3
Planning Requirement[7]	3	C R D (AP EC) 491 Internship	3
Specialization[8]	3	Specialization[8]	5
Elective	3	Elective	3
	17		17

133-134 Total Semester Hours

[1]A two-semester sequence from the College of Sciences in the same physical or biological science, each including a laboratory.
[2]Select from foreign language, humanities, music, philosophy.
[3]ENGL 202, 208, 209.
[4]Select from 200- or 300-level courses in geography, history, political science, psychology, sociology.
[5]ECON 302, 315, 410, MGT 301, 305, 307, MKT 301.
[6]Select from 300- or 400-level courses in geography, history, political science, psychology, sociology.
[7]C R P 411, 415, 472.
[8]See adviser for available specialization and course requirements.

AGRICULTURAL EDUCATION

Agricultural Education provides broad preparation in agricultural sciences and professional education, including communications and human-relations skills.

In addition to required courses, students may elect minor study in agricultural management, mechanization, horticulture, forestry, or production agriculture. Students in other departments within the College of Agricultural Sciences may minor in Agricultural Education and be certified to teach when they meet the minimum requirements.

The Bachelor's degree prepares students for professional education positions in the mainstream of agriculture including teaching, cooperative extension service, and governmental agricultural agencies such as SCS, FmHA, or ASCS. This degree prepares students for other forms of educational work such as agricultural missionary, public relations, and positions as training officers in agricultural industry, both domestic and international.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Introduction to Animal Industries	3	AG ED 100 Orientation and Field Exp	1
AGRIC 200 Agric. Appl. of Microcomputers	3	AGRIC 104 Introduction to Plant Sciences	3
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
Mathematics Requirement[1]	3	Mathematics Requirement[1]	3
	16	Elective	1
			15

SOPHOMORE YEAR

AG ED 201 Introduction to Agricultural Education	3	AP EC 202 Agricultural Economics	3
AG M 205 Principles of Farm Shop	3	CH 102 or 112 General Chemistry	4
or AG M 206 Agricultural Mechanization	3	or CH 106 Beg. Gen. and Organic Chemistry	4
CH 101 General Chemistry	4	HORT 208 Landscape Appreciation	3
or CH 105 Beg. Gen. and Organic Chemistry	4	Literature Requirement[3]	3
HIST 322 History of Technology	3	Elective	3
or HIST 323 History of American Technology	3		16
Humanities Requirement[2]	3		
	16		

JUNIOR YEAR

AG M 301 Soil and Water Conservation	3	ADVSC 301 Feeds and Nutrition	3
or AG M 452 Farm Power	3	ED 302 Educational Psychology	3
AGRON 202 Soils	4	ENGL 231 Introduction to Journalism	3
AP EC 302 Economics of Farm Management	3	or ENGL 304 Business Writing	3
ENT 301 General Entomology	4	or SPCH 250 Public Speaking	3
Minor[4]	6	Minor[4]	6
	20	Elective	3
			18

SENIOR YEAR

AG ED 400 Supv. Field Exp. II	1	AG ED 406 Directed Teaching	12
AG ED 401 Methods in Agric. Education	3	AG ED 423 Curriculum	2
FOR 305 Elements of Forestry	3	AG ED 425 Teaching Agricultural Mechanics	2
PL PA 401 Plant Pathology	3		16
Minor[4]	3		
Elective	4		
	17		

134 Total Semester Hours

[1]A minimum of 6 credits in mathematical sciences is required, excluding MTHSC 115, 116, 215, 216. EX ST 301 may be included.
[2]See Humanities section under General Education Requirements.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]See adviser for available minor areas and course requirements.

AGRICULTURAL ENGINEERING

Graduates in Agricultural Engineering are well-equipped to apply engineering to many functions affecting the well-being of mankind. They have broad training in mathematics, physics, chemistry, and biological sciences as well as comprehensive coverage of the engineering sciences. Agricultural engineers are sought by industry and public service organizations primarily for their ability to apply engineering expertise to living systems and to the management of land and water resources. Specific areas of emphasis are as follows:

1. Agricultural Production and Consumer Products Engineering
2. Biotechnology Engineering
3. Food Engineering
4. Natural Resources Engineering

This curriculum includes courses in such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, instrumentation computing devices and systems analysis. Courses in the basic sciences appropriate to the areas of emphasis provide a foundation for engineering design and development and for the management of biological systems. In addition, important facets of energy conversion, research methods, use of economy and integrity in design and protection, modification, and control of the environment are included.

Graduate programs lead to the Master of Science, Master of Engineering, and Doctor of Philosophy degrees.

Opportunities for employment of agricultural engineering graduates include design, research, production and sales with industry plus teaching, research, extension, and field engineering with governmental agencies. Agricultural engineers are also equipped for self-employment as consulting engineers or as owners of businesses providing engineering services and related products.

FRESHMAN YEAR PROGRAM

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry[3]	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
ENGR 180 Computers in Engineering[1]	3	ENGR 101 Introduction to Engineering[1]	1
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
Humanities/Social Science Requirement[2]	3	PHYS 122 Physics with Calculus I	3
	17	Elective	3
			18

[1]One-half of the entering freshman class will enroll during the first semester, the other one-half will enroll during the second semester.
[2]See Policy on Humanities and Social Sciences for Engineering Curricula, page 130.
[3]See adviser.

AGRICULTURAL PRODUCTION AND CONSUMER PRODUCTS EMPHASIS

SOPHOMORE YEAR

First Semester		Second Semester	
AG E 221 Survey. for Soil and Water Res	2	AG E 214 Fab. and Mfg. Meth. for Ag. Sys	2
E G 209 Introduction to Engr./Comp. Graphics	2	ECON 211 Principles of Microeconomics[1]	3
E M 201 Engineering Mechanics: Statics	3	or ECON 200 Economic Concepts[1]	3
MTHSC 206 Calculus of Several Variables	4	E M 202 Engineering Mechanics: Dynamics	3
PHYS 221 Physics with Calculus II	3	MTHSC 208 Intro. to Ord. Diff. Equa	4
Elective	3	PHYS 222 Physics with Calculus III	3
	17	Literature Requirement[3]	3
			18

JUNIOR YEAR

AG E 356 Mach. Op. for Ag. and Biol. Sys.	3
E C E 307 Basic Electrical Engineering	2
E C E 309 Electrical Engineering Lab. I	1
E M 304 Mechanics of Materials	3
M E 310 Thermodynamics and Heat Transfer	3
Mathematics Requirement[5]	3
Plant/Animal Science Requirement[4]	3
	18

AG E 322 Small Watershed Hyd. and Sed.	2
AG E 333 Environ. Mod. and Cont. for Agric. and Biological Systems	2
AG E 350 Microcomp. Controls in Biosys.	2
AG E 362 Energy Conv. in Ag. and Biol. Sys.	3
AGRON 202 Soils	4
E M 305 Mechanics of Materials Lab	1
or EM 322 Fluid Mechanics Lab	1
E M 320 Fluid Mechanics	3
ENGL 314 Technical Writing	3
or SPCH 250 Public Speaking	3
	20

SENIOR YEAR

AG E 416 Mech. Des. for Ag. and Biol. Sys.	3
AG E 450 Instru. for Ag. and Biol. Sys.	3
AG E 471 Engr. Research and Management	2
I E 384 Engineering Economic Analysis	3
Humanities/Social Science Requirement[2]	3
Technical Requirement[6]	3
	17

AG E 421 Engr. Sys. for Soil Water Mgt.	2
AG E 431 Agric. Struc. and Environ. Des.	3
AG E 442 Prop. and Proc. of Biol. Prod.	3
Humanities/Social Science Requirement[2]	3
Technical Requirement[6]	3
Elective	4
	18

143 Total Semester Hours

[1]ECON 200 is a terminal course. ECON 211 is preferred prerequisite for upper-level courses.
[2]See Policy on Humanities and Social Sciences for Engineering Curricula.
[3]Choose 3 credits from Humanistic/Social Policy list.
[4]Choose 3 credits from AGRIC 103, 104, ADVSC 202, BIOL 103, P S 201.
[5]Choose from EX ST 301, MTHSC 301, 434.
[6]See adviser.

BIOTECHNOLOGY ENGINEERING EMPHASIS

See page 72 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CH 201 Survey of Organic Chemistry	4	AG E 214 Fab. and Mfg. Meth. for Ag. Sys.	2
E G 209 Intro. to Engr./Comp. Graphics	2	BIOCH 301 General Biochemistry	3
E M 201 Engineering Mechanics: Statics	3	BIOCH 302 Molecular Biology Lab	1
MTHSC 206 Calculus of Several Variables	4	E M 202 Engineering Mechanics: Dynamics	3
PHYS 221 Physics with Cal. II	3	MTHSC 208 Intro. to Ord. Diff. Equa.	4
Elective	2	PHYS 222 Physics with Cal. III	3
	18	Elective	2
			18

JUNIOR YEAR

E C E 307 Basic Electrical Engineering	2
E C E 309 Electrical Engineering Lab. I	1
E M 304 Mechanics of Materials	3
M E 310 Thermodynamics and Heat Transfer	3
MICRO 305 General Microbiology	4
Literature Requirement[2]	3
Mathematics Requirement[1]	3
	19

AG E 333 Environ. Mod. and Cont. for Agric. and Biological Systems	2
AG E 350 Microcomp. Controls in Biosys.	2
AG E 362 Energy Conv. in Ag. and Biol. Sys.	3
AG E (BIOSC) 430 Engr. Model. of Biol. Sys.	3
E M 320 Fluid Mechanics	3
E M 322 Fluid Mechanics Lab	1
or EM 305 Mechanics of Materials Lab	1
ENGL 314 Technical Writing	3
or SPCH 250 Public Speaking	3
Elective	2
	19

SENIOR YEAR

AG E 416 Mech. Des. for Ag. and Biol. Sys.	3
AG E 450 Instru. for Ag. and Biol. Sys.	3
AG E 471 Engr. Research and Management	2
CH E (AG E) 428 Biochemical Engineering	3
Advanced Biology Requirement[4]	4
Humanities/Social Science Requirement[5]	3
	18

AG E 421 Engr. Sys. for Soil Water Mgt.	2
AG E 429 Appl. in Biotech. Engr.	3
AG E 442 Prop. and Proc. of Biol. Prod.	3
ECON 211 Principles of Microeconomics[3]	3
or ECON 200 Economic Concepts[3]	3
Humanities/Social Science Requirement[5]	3
Elective	2
	16

143 Total Semester Hours

[1]Choose 3 credits from EX ST 301, MTHSC 301, 434.
[2]Choose 3 credits from Humanities/Social Policy list.
[3]ECON 200 is a terminal course. ECON 211 is preferred prerequisite for upper-level courses.
[4]Choose 4 credits from AN PH 301, BOT 421, MICRO 412, 418, ZOOL 457, 459.
[5]See policy on Humanities and Social Sciences for Engineering Curricula.

FOOD ENGINEERING EMPHASIS

See page 72 for Freshman year.

SOPHOMORE YEAR

First Semester

CH 201 Survey of Organic Chemistry 4
E G 209 Intro. to Engr./Comp. Graphics 2
E M 201 Engineering Mechanics: Statics 3
MTHSC 206 Calculus of Several Variables 4
PHYS 221 Physics with Cal. II 3
Elective 2
18

Second Semester

AG E 214 Fab. and Mfg. Meth. for Ag. Sys 2
BIOCH 301 General Biochemistry 3
BIOCH 302 Molecular Biology Lab 1
E M 202 Engineering Mechanics: Dynamics 3
MTHSC 208 Intro. to Ord. Diff. Equa 4
PHYS 222 Physics with Calculus III 3
Elective 2
18

JUNIOR YEAR

AG E 356 Mach. Op. for Agric. and Biol. Sys 3
E C E 307 Basic Electrical Engineering 2
E C E 309 Electrical Engineering Lab. I 1
ECON 211 Principles of Microeconomics[1] 3
or ECON 200 Economic Concepts[1] 3
E M 304 Mechanics of Materials 3
M E 310 Thermodynamics and Heat Transfer 3
Literature Requirement[2] 3
18

AG E 333 Environ. Mod. and Cont. for Agric. and Biological Systems 2
AG E 350 Microcomp. Controls in Biosys 2
AG E 362 Energy Conv. in Ag. and Biol. Sys 3
E M 305 Mechanics of Materials Lab. 1 1
or E M 322 Fluid Mechanics Lab 1
E M 320 Fluid Mechanics 3
ENGL 314 Technical Writing 3
or SPCH 250 Public Speaking 3
MICRO 305 General Microbiology 4
Elective 1
19

SENIOR YEAR

AG E 416 Mech. Des. for Ag. and Biol. Sys 3
AG E 450 Instru. for Ag. and Biol. Sys 3
AG E 471 Engr. Research and Management 2
CH E (AG E) 428 Biochemical Engineering 3
FD SC 401 Food Chemistry I 4
Humanities/Social Science Requirement[3] 3
18

AG E 429 Appl. in Biotech. Engr 3
AG E 442 Prop. and Proc. of Biol. Prod 3
MICRO 407 Food and Dairy Microbiology 4
Approved Emphasis Requirement[4] 2
Humanities/Social Science Requirement[3] 3
Elective 2
17

143 Total Semester Hours

[1]ECON 200 is a terminal course. ECON 211 is preferred prerequisite for upper-level courses.
[2]Choose 3 credits form Humanities/Social Policy list.
[3]See Policy on Humanities and Social Sciences for Engineering Curricula.
[4]Choose 2 credits from AG E 322, 421, 431, 473, FD SC 403, PKGSC 404.

NATURAL RESOURCES ENGINEERING EMPHASIS

See page 72 for Freshman year.

SOPHOMORE YEAR

AG E 221 Survey. for Soil and Water Res 2
E G 209 Intro. to Engr./Comp. Graphics 2
E M 201 Engineering Mechanics: Statics 3
MTHSC 206 Calculus of Sev. Var 4
PHYS 221 Physics with Cal. II 3
Elective 3
17

AG E 214 Fab. and Mfg. Meth. for Ag. Sys 2
ECON 211 Principles of Microeconomics[1] 3
or ECON 200 Economic Concepts[1] 3
E M 202 Engineering Mechanics: Dynamics 3
MTHSC 208 Intro. to Ord. Diff. Equa 4
PHYS 222 Physics with Cal. III 3
Literature Requirement[2] 3
18

JUNIOR YEAR

AG E 356 Mach. Op. for Ag. and Biol. Sys 3
E C E 307 Basic Electrical Engineering 2
E C E 309 Electrical Engineering Lab. I 1
E M 304 Mechanics of Materials 3
M E 310 Thermodynamics and Heat Transfer 3
Biological Science Requirement[3] 4
Mathematics Requirement[4] 3
19

AG E 322 Small Watershed Hyd. and Sed 2
AG E 333 Environ. Mod. and Cont. for Agric. and Biological Systems 2
AG E 350 Microcomp. Controls in Biosys 2
AG E 362 Energy Conv. in Ag. and Biol. Sys 3
AGRON 202 Soils 4
E M 305 Mechanics of Materials Lab 1
or E M 322 Fluid Mechanics Lab. 1
E M 320 Fluid Mechanics 3
ENGL 314 Technical Writing 3
or SPCH 250 Public Speaking 3
20

SENIOR YEAR

AG E 416 Mech. Des. for Ag. and Biol. Sys.	3	AG E 364 Agric. Waste Mg. Sys.	2
AG E 450 Instru. for Ag. and Biol. Sys.	3	AG E 421 Engr. Sys. for Soil Water Mgt.	2
AG E 471 Engr. Research and Management	2	AG E 431 Agric. Struc. and Environ. Des.	3
Approved Engineering Requirement[6]	3	Humanities/Social Science Requirement[7]	3
Humanities/Social Science Requirement[7]	3	Technical Requirement[8]	3
Science Requirement[5]	3	Elective	4
	17		17

143 Total Semester Hours

[1]ECON 200 is a terminal course. ECON 211 is preferred prerequisite for upper-level courses.
[2]Choose 3 credits from Humanistic/Social Policy list.
[3]Choose 4 credits from BIOL 103, BOT 421, and either MICRO 205 or 305.
[4]Choose 3 credits from EX ST 301, MTHSC 301, 434.
[5]Choose 3 credits from AGRIC 440, BIOCH 301, CH 201, GEOL 101 or from Biological Science Requirement list.
[6]Choose 3 credits from Approved Engineering Requirement list.
[7]See Policy on Humanities and Social Sciences for Engineering Curricula.
[8]Choose 3 credits from Biological Sciences, Science, or Approved Engineering Requirement list.

AGRICULTURAL MECHANIZATION AND BUSINESS

The major in Agricultural Mechanization and Business is designed to provide an educational program for undergraduate students who desire training in areas which are relevant to dynamic agricultural enterprise. It is organized with strength in both business management and technical support of agriculture and agribusiness. In order to produce an individual who is well rounded and capable of communicating, the curriculum includes courses in the humanities, social sciences, English composition, and public speaking.

The graduate in agriculture with a major in Agricultural Mechanization and Business finds meaningful and remunerative employment in a variety of situations directly and indirectly related to agricultural production, processing, marketing, and the many services connected therewith.

FRESHMAN YEAR

First Semester		Second Semester	
AG M 101 Introduction to Mech. and Business	1	AGRIC 104 Introduction to Plant Sciences	3
AGRIC 103 Introduction to Animal Industry	3	BIOL 104 General Biology II	4
BIOL 103 General Biology I	4	CH 102 or 112 General Chemistry	4
CH 101 General Chemistry	4	ENGL 102 Composition II	3
ENGL 101 Composition I	3	Mathematics Requirement[1]	3
Mathematics Requirement[1]	3		17
	18		

SOPHOMORE YEAR

AG M 205 Principles of Farm Shop	3	ACCT 201 Principles of Accounting	3
AGRIC 200 Agric. App. of Microcomputers	3	AG M 206 Agric. Mechanization	3
AP EC 202 Agricultural Economics	3	PHYS 208 General Physics II	4
E G 109 Engineering Graphics	2	Humanities Requirements[4]	3
PHYS 207 General Physics I	4	Social Science Requirement[3]	3
Literature Requirement[2]	3		16
	18		

JUNIOR YEAR

AG M 302 Rainfall, Runoff, and Erosion Control	3	AG M 402 Drainage, Irrigation, and Waste Mgt	3
AG M 303 Cal. for Mech. Agric.	3	AG M 406 Mech. and Hydraulic Systems	3
AP EC 302 Econ. of Farm Management	3	AGRON 202 Soils	4
AP EC 351 Agric. Sales, Merch., and Advertising	3	AP EC 309 Econ. of Agric. Marketing	3
or AP EC 352 Public Finance	3	ENGL 231 Introduction to Journalism	3
Social Science Requirement[3]	3	or ENGL 304 Business Writing	3
Elective	3	SPCH 250 Public Speaking	3
	18		19

SENIOR YEAR

AG M 452 Farm Power	3	AG M 401 Environmental Control for Plants and Animals	1
AG M 460 Farm and Home Utilities	3	AG M 403 Structures for Plants and Animals	2
AG M 472 Seminar	1	AG M 408 Equip. Sales and Service	3
AP EC 319 Agribusiness Management	3	Economics Requirement[5]	3
or AP EC 409 Commodity Futures Market	3	Elective	7
Economics Requirement[5]	3		16
Agriculture Requirement[6]	3		
	16		

138 Total Semester Hours

[1]A minimum of 6 credits to be selected from MTHSC 102, 105, 106.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]ED 302, GEOG 101, 301, 302, HIST 101, 102, 172, 173, PO SC 101, PSYCH 201, 401, SOC 201, or any agricultural and applied economics and rural sociology courses.
[4]Select Humanities from General Education Requirements.
[5]Select from agricultural and applied economics or economics courses.
[6]Select courses from the College of Agricultural Sciences.

AGRONOMY

The science of Agronomy is the application of basic science such as chemistry, microbiology, physics, botany, and genetics to food and fiber crop production systems. The agronomic crops account for the bulk of the primary agricultural production in the United States and the world. Career opportunities for agronomy majors exist beyond those usually associated with traditional agriculture. A degree in Agronomy can be an entry into environmental sciences, biotechnology, international agriculture, genetic engineering, and the new high-tech world of agriculture.

The degree in Agronomy can lead to a job in industry, government, or business. It can also be a stepping stone to graduate work and a career in research. Because the Agronomy curriculum is a combination of basic and applied sciences, it provides flexibility not found in other areas.

Students majoring in Agronomy will select from three study areas: Agronomic Systems, Soil and Environment, and Weed Science. Students wishing to minor in Agronomy must satisfy the requirements as described in the Minors section of the catalog.

AGRONOMIC SYSTEMS STUDY AREA

This study area provides a comprehensive agronomy curriculum which can prepare the student for a career in crop consulting, extension education, farm management, and industries requiring a knowledge of agricultural or managed ecosystems. It will also prepare the student for graduate work in one of the crop-related areas such as crop physiology, plant breeding and genetics, crop management, plant-soil-environment relationships, and soil fertility.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 103 Introduction to Animal Industries	3	AGRIC 104 Introduction to Plant Sciences	3
CH 101 General Chemistry	4	AP EC 202 Agricultural Economics	3
ENGL 101 Composition I	3	CH 112 General Chemistry	4
MTHSC 102 Intro. to Math. Analysis	3	ENGL 102 Composition II	3
or MTHSC 106 Calculus of One Variable I	4	EX ST 301 Introductory Statistics	3
Social Science Requirement[1]	3	or MTHSC 108 Calculus of One Variable II	4
	16-17	or MTHSC 207 Multivariable Calculus	3
			16-17

SOPHOMORE YEAR

AGRON 202 Soils	4	AGRIC 200 Agric. Appl. of Microcomputer	3
BIOL 103 General Biology I	4	BOT 205 Plant Form and Function	4
CH 223 Organic Chemistry	3	PHYS 200 Introductory Physics	4
and CH 227 Organic Chemistry Lab	1	Humanities Requirement[1]	3
or BIOCH 210 Elementary Biochemistry	4	Elective	3
Literature Requirement[6]	3		17
Elective	3		
	18		

JUNIOR YEAR

BOT 421 Plant Physiology	4	AGRON (AP EC) 426 Cropping Systems Analysis	3
GEN 302 Introductory Genetics	4	AGRON 452 Soil Fertility and Management	3
SPCH 250 Public Speaking	3	Agronomy Requirement[4]	6
Crop Production Requirement[2]	3	Crop Production Requirement[2]	3
Pest Management Requirement[3]	3	Pest Management Requirement[3]	3
	17		18

SENIOR YEAR

AGRON 455 Seminar	1	BIOSC 441 Ecology	4
ENGL 314 Technical Writing	3	Agronomic Specialty Requirement[5]	3
Agronomic Specialty Requirement[5]	3	Agronomy Requirement[4]	3
Agronomy Requirement[4]	5	Elective	6
Elective	4		16
	16		

134 Total Semester Hours

[1]See General Education Requirements.
[2]Select at least two of the following: AGRON 421, 422, 423.
[3]Select at least two courses from the following: AGRON 407, ENT 301, PL PA 401.
[4]Select at least 14 credits from the following: AGRON 403, 405, 407, 421, 422, 423, 425, 446, 453, 475, 490, ENT 301, AGRON (HORT) 433, PL PA 401, and no more than 3 hours from AGRON 350 or 406.
[5]Select at least two of the following: AGRON 405, 425, 490.
[6]ENGL 202, 203, 204, 205, 206, 207, 208, 209.

SOIL AND ENVIRONMENT STUDY AREA

This study area gives students an understanding of soil as a natural resource and as a component of all terrestrial ecosystems. The student will learn how soils influence ecological processes which take place above and below the ground. An understanding of these processes will enable the student to deal with traditional agricultural production issues as well as environmental management problems such as groundwater protection and the most appropriate use for a particular landscape. The student can aim toward a variety of special areas including soil biology, fertility, chemistry, physics, mineralogy, and morphology.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	AGRIC 104 Introduction to Plant Sciences	3
CH 101 General Chemistry	4	BIOL 104 General Biology II	4
ENGL 101 Composition I	3	CH 112 General Chemistry	4
MTHSC 106 Calculus of One Variable I[1]	4	ENGL 102 Composition II	3
	15	MTHSC 108 Calculus of One Variable II[1]	4
			18

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	AGRON 202 Soils	4
and CH 227 Organic Chemistry Lab	1	CH 224 Organic Chemistry	3
or CH 201 Survey of Organic Chemistry	4	and CH 228 Organic Chemistry Lab	1
GEOL 101 Physical Geology	3	or BIOCH 210 Elementary Biochemistry	4
GEOL 103 Physical Geology Lab	1	EN SC 200 Intro. to Environmental Science	3
PHYS 207 General Physics[4]	4	PHYS 208 General Physics[5]	4
Humanities Requirement[3]	3	Literature Requirement[6]	3
Social Science Requirement[2]	3		18
	18		

JUNIOR YEAR

AGRIC 200 Agric. Appl. of Microcomputers[7]	3
CH 313 Quantitative Analysis	3
CH 315 Quantitative Analysis Lab	2
SPCH 250 Public Speaking	3
Agronomy Crops Option[9]	3
Environmental Science Option[8]	3
	17
AGRON 452 Soil Fertility and Management	3
AGRON 453 Soil and Fertility Lab	1
AGRON 475 Soil Physics and Chemistry	3
ENGL 314 Technical Writing	3
MICRO 305 General Microbiology	4
Environmental Science Option[8]	3
	17

SENIOR YEAR

AGRON 403 Soil Genesis and Classification	2
AGRON 455 Seminar	1
AGRON 490 Soil Organisms in Crop Production	3
Environmental Science Option[8]	3
Elective	6
	15
AGRON 408 Land Treatment of Wastewater	3
BOT 421 Plant Physiology	4
or GEN 302 Introductory Genetics	4
EN SC 400 Studies in Environmental Science	3
Social Science Requirement[2]	3
Elective	4
	17

135 Total Semester Hours

[1]MTHSC 102 and 207 may be taken in lieu of MTHSC 106 and 108.
[2]See General Education Requirements; must include 3 hours of agricultural and applied economics or economics.
[3]See General Education Requirements.
[4]PHYS 122/124 may be substituted.
[5]PHYS 221/223 may be substituted.
[6]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[7]CP SC 110 can be substituted.
[8]See adviser.
[9]AGRON 421, 422, 423, 426.

WEED SCIENCE STUDY AREA

This study area is designed for those who have special interest in the agricultural chemical industry, in consulting where weed control is to be the area of specialization, and in research and extension education. Courses include plant physiology, pathology, entomology, and pesticide toxicology and provide a broad education in pest control.

The student who is interested in graduate work can plan for specialization in such areas as weed physiology, ecology, and control or herbicide technology.

FRESHMAN YEAR

AGRIC 103 Intro. to Animal Industries	3
CH 101 General Chemistry	4
ENGL 101 Composition I	3
MTHSC 102 Intro. to Math. Analysis	3
or MTHSC 106 Calculus of One Var. I	4
Social Science Requirement[1]	3
	16-17
AGRIC 104 Intro. to Plant Sciences	3
AP EC 202 Agricultural Economics	3
CH 112 General Chemistry	4
ENGL 102 Composition I	3
EX ST 301 Introductory Statistics	3
or MTHSC 108 Calculus of One Var. II	4
or MTHSC 207 Multivariable Calculus	3
	16-17

SOPHOMORE YEAR

AGRON 202 Soils	4
BIOL 103 General Biology I	4
CH 223 Organic Chemistry	3
and CH 227 Organic Chemistry Lab	1
or BIOCH 210 Elem. Biochemistry	4
Literature Requirement[2]	3
Elective	3
	18
AGRIC 200 Agric. Appl. of Microcomputers	3
BOT 205 Plant Form and Function	4
PHYS 200 Introductory Physics	4
Humanities Requirement[1]	3
Elective	3
	17

JUNIOR YEAR

AGRON 421 Field Crops—Monocots	3
AGRON 490 Soil Organisms and Crop. Prod.	3
BOT 431 Introductory Plant Taxonomy	4
GEN 302 Introductory Genetics	4
SPCH 250 Public Speaking	3
	17
AGRON 422 Field Crops—Dicots	3
AGRON (AP EC) 426 Cropping Systems Analysis	3
AGRON 452 Soil Fertility and Management	3
ENT 301 General Entomology	4
PL PA 401 Plant Pathology	3
Agronomy Requirement[3]	3
	19

SENIOR YEAR

AGRON 407 Weed Ecology and Management	3	AGRON (HORT) 433 Integrated Weed Mgt	3
AGRON 446 Soil Management	3	ENGL 314 Technical Writing	3
AGRON 455 Seminar	1	ENT 420 Toxicology of Insecticides	3
BIOSC 441 Ecology	4	Agronomy Requirement[3]	3
BOT 421 Plant Physiology	4	Elective	3
Elective	2		15
	17		

135 Total Semester Hours

[1]See General Education Requirement.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]AGRON 423, HORT 352, 412, 456.

ANIMAL INDUSTRIES

The Bachelor of Science degree program in Animal Industries includes two curricula: Animal, Dairy and Veterinary Sciences and Poultry Science.

ANIMAL, DAIRY AND VETERINARY SCIENCES MAJOR

The curriculum in Animal, Dairy and Veterinary Sciences is designed to provide students with a broad base of understanding of scientific principles and application of these principles to scientific, technical, and business phases of livestock production, processing and marketing. Completion of general education requirements, basic sciences, applied sciences, and student-selected courses in areas of personal interest well prepare graduates for a successful career. All students complete a common freshman year, and the curriculum is then divided into three emphasis areas: Production and Business, Preveterinary and Science, and Meat and Dairy Foods. Each emphasis area includes specialized courses unique to students pursuing careers in those areas.

Many opportunities are available to Animal, Dairy and Veterinary Sciences graduates. Examples include (but are not limited to) production, sales and marketing, business management, advertising, extension, meat and dairy industry, and teaching. Graduates in the Preveterinary and Sciences Emphasis area also meet all requirements for admission to graduate school or the veterinary medicine program for the University of Georgia and Tuskegee University.

FRESHMAN YEAR PROGRAM

First Semester		Second Semester	
ADVSC 100 Orientation to Animal, Dairy and Veterinary Sciences	1	ADVSC 108 Animal and Dairy Science Techniques	1
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
or BIOL 110 Principles of Biology I	5	or BIOL 111 Principles of Biology II	5
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry[2]	4
ENGL 101 Composition I	3	ENGL 102 English Composition II	3
Humanities Requirement[1]	3	Mathematics Requirement[3]	3
Elective	1	Elective	1
	16-17		16-17

PRODUCTION AND BUSINESS EMPHASIS AREA

SOPHOMORE YEAR

First Semester		Second Semester	
ACCT 200 Basic Accounting	3	AGRIC 200 Agricultural Application of Microcomputers	3
ADVSC 202 Introductory Animal Sciences	3	AP EC 202 Agricultural Economics	3
ADVSC 210 Animal Science Techniques	1	SPCH 250 Public Speaking	3
or ADVSC 203 Dairy Science Techniques	1	Animal Products Requirement[4]	3
EX ST 301 Introductory Statistics	3	or Elective	3-4
Humanities/Literature Requirement[1]	3	Plant or Soil Science Requirement[5]	3
Elective	4		15-16
	17		

JUNIOR YEAR

AP EC 302 Economics of Farm Management	3
or AP EC 319 Agribusiness Management	3
AN PH 301 Phy. and Anatomy of Domestic Animals	4
BIOCH 210 Elementary Biochemistry	4
Agricultural Mechanization Requirement[6]	3
Animal Product Requirement[4]	3
or Elective	3-4
	17-18

ADVSC 301 Feeds and Nutrition	3
ADVSC 302 Livestock Selection	2
or ADVSC 311 Dairy Cattle Selection	2
ADVSC 306 Feeds and Nutrition Lab	1
ADVSC 453 Animal Reproduction	3
AP EC 309 Economic of Agricultural Marketing	3
Animal Production Requirement[7]	3
Elective	2
	17

SENIOR YEAR

ADVSC 406 Seminar and Related Topics	2
AP EC 351 Agricultural Sales Merch. and Adv	3
AP EC 409 Commodity Futures Markets	3
GEN 302 Introductory Genetics	4
Animal Production Requirement[7]	3
Elective	3
	18

ADVSC 452 Animal Breeding	3
AP EC 460 Agricultural Finance	3
MGT 307 Personnel Management	3
Animal Production Requirement[7]	4
Communications Requirement[10]	3
Elective	2
	18

134 Total Semester Hours

MEAT AND DAIRY FOODS EMPHASIS AREA

SOPHOMORE YEAR

First Semester

ACCT 200 Basic Accounting	3
ADVSC 202 Introductory Animal Sciences	3
ADVSC 203 Dairy Science Techniques	1
or ADVSC 101 Dairy Foods	1
or ADVSC 210 Animal Science Techniques	1
AGRIC 200 Agricultural Applic. of Microcomputers	3
CH 201 Survey of Organic Chemistry	4
Elective	3
	17

Second Semester

ADVSC 253 Meats	2
ADVSC 255 Meats Lab	1
AP EC 202 Agricultural Economics	3
or ECON 211 Principles of Microeconomics	3
PHYS 200 Introductory Physics	4
SPCH 250 Public Speaking	3
Elective	4
	17

JUNIOR YEAR

ADVSC 307 Fluid Milk	4
ADVSC 380 Mus. Growth and Meat Fab	3
AN PH 301 Physiology and Anat. of Dom. Animals	4
BIOCH 210 Elementary Biochemistry	4
Elective	2
	17

ADVSC 400 Dairy Processing I	4
FD SC 422 Quality Assurance and Sensory Evaluation	2
FD SC 424 Quality Assurance and Sensory Evaluation Lab	1
EX ST 301 Introductory Statistics	3
MICRO 305 General Microbiology	4
or Nutrition Requirement[8]	4
Humanities/Literature Requirement[1]	3
	17

SENIOR YEAR

ADVSC 402 Dairy Processing II	4
ADVSC 406 Seminar and Related Topics	2
AP EC 351 Agricultural Sales Merchandising and Adv	3
FD SC 403 Food Preserv. and Proc. I	3
FD SC 405 Food Preserv. and Proc. Lab. I	1
MICRO 305 General Microbiology	4
or Nutrition Requirement[8]	4
	17

MICRO 407 Food and Dairy Microbiology	4
Animal Production Requirement[7]	4
Emphasis Area Requirement[11]	4
Elective	5
	17

134 Total Semester Hours

PREVETERINARY AND SCIENCE EMPHASIS AREA

SOPHOMORE YEAR

First Semester

ADVSC 202 Introductory Animal Science	3
ADVSC 203 Dairy Science Techniques	1
CH 223 Organic Chemistry	3
CH 227 Organic Chemistry Lab	1
PHYS 207 General Physics I	4
Humanities/Literature Requirement[1]	3
Elective	1
	16

Second Semester

AGRIC 200 Agric. App. of Microcomputers	3
CH 224 Organic Chemistry	3
CH 228 Organic Chemistry Lab	1
EX ST 301 Introductory Statistics	3
PHYS 208 General Physics II	4
Social Science Requirement[1]	3
	17

JUNIOR YEAR

ADVSC 210 Animal Science Techniques	1	ADVSC 301 Feeds and Nutrition	3
AN PH 301 Phys. and Anat. of Dom. Animal	4	ADVSC 306 Feeds and Nutrition Lab	1
BIOCH 301 General Biochemistry	3	ADVSC 453 Animal Reproduction	3
and BIOCH 302 Molecular Biology Lab	1	GEN 302 Introductory Genetics	4
or BIOCH 210 Elementary Biochemistry	4	Animal Production Requirement[7]	3
MICRO 305 General Microbiology	4	Social Science Requirement[1]	3
SPCH 250 Public Speaking	3		17
Elective	2		
	18		

SENIOR YEAR

ADVSC 406 Seminar and Related Topics	2	ADVSC 452 Animal Breeding	3
NUTR 401 Fundamentals of Nutrition	3	Animal Production Requirement[7]	4
Animal Production Requirement[7]	3	Animal Products Requirement[4]	3
Animal Products Requirement[4]	3	or Elective	3-4
or Elective	3-4	Communications Requirement[9]	3
Elective	6	Elective	4
	17-18		17-18

134 Total Semester Hours

[1]Select from courses fulfilling General Education Requirements.
[2]CH 112 is required for Preveterinary and Science Emphasis Area.
[3]MTHSC 102 or 106 is required for Preveterinary and Science Emphasis Area.
[4]The Animal Products Requirement must be met by all students in this emphasis area and is satisfied with either ADVSC 307 or 253 and 255. Electives may be taken in the alternate semester.
[5]AGRIC 104, AGRON 202 or 423.
[6]Select from agricultural mechanization courses as approved by adviser.
[7]Select one course from ADVSC 401, 404, 408, 412, or P S 402. (Tuskegee University Veterinary School requires 3 credits of poultry science.) Remaining credits may include additional courses from preceding list or include ADVSC 310, 380, 400, 402, 403, 455 or 461.
[8]MICRO 305 is required of all students in this emphasis area. Students are also required to take ADVSC 301 and 306 or NUTR 401.
[9]ENGL 231, 304, 312, 314, 316.
[10]Select from courses approved by adviser.

POULTRY SCIENCE MAJOR

This curriculum provides the student with a broad education in science and the humanities and specialized knowledge of the biology of the avian species and of the poultry industry. Avian science courses emphasize the nutrition, physiology, and pathology of domesticated and semi-domesticated birds. The environmental requirements for propagating the various species and for handling eggs and meat are covered. Minors provide for the student's specialized interests.

Job opportunities include supervisory positions with producers of eggs, broilers, turkeys, or game birds; technical representatives for feed manufacturers, vitamin and mineral suppliers, pharmaceutical and biological houses; extension specialists; teachers or researchers; salesmen or marketing specialists; quality control and poultry products technologists; government graders, inspectors or sanitarians.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	AGRIC 104 Intro. to Plant Sciences	3
CH 101 General Chemistry	4	BIOL 104 General Biology II	4
ENGL 101 Composition I	3	CH 112 General Chemistry	4
MTHSC 102 Intro. to Math. Analysis[1]	3	ENGL 102 Composition II	3
P S 101 Avian Pets	1	MTHSC 101 Finite Probability[1]	3
	15		17

SOPHOMORE YEAR

AP EC 202 Agricultural Economics	3	ADVSC 202 Intro. Animal Science	3
or ECON 200 Economic Concepts	3	AGRIC 200 Agric. Applications of Microcomputers	3
or ECON 211 Principles of Microeconomics	3	or CP SC 120 Intro. to Infor. Proc. Sys.	3
BIOCH 210 Elementary Biochemistry[2]	4	ENGL 231 Introduction to Journalism	3
P S 201 Poultry Husbandry	3	or ENGL 304 Business Writing	3
Literature Requirement[3]	3	or ENGL 314 Technical Writing	3
Elective	5	MICRO 305 General Microbiology	4
	18	PHYS 200 Introductory Physics[4]	4
			17

JUNIOR YEAR

ADVSC 301 Feeds and Nutrition	3
GEN 302 Introductory Genetics	4
SPCH 250 Public Speaking	3
Minor[7]	3
Social Science Requirement[6]	3
	16

AN PH 301 Physiology and Anat. of Dom. Animals	4
P S 355 Poultry Products Grading and Tech	3
P S 402 Poultry Management	2
Humanities Requirement[5]	3
Minor[7]	6
	18

SENIOR YEAR

MGT 301 Principles of Management	3
P S 451 Poultry Nutrition	2
P S 453 Poultry Nutrition Lab	1
P S 458 Avian Micro. and Parasitology	4
Minor[7]	3
Elective	4
	17

P S 400 Avian Physiology	3
P S 460 Seminar	1
Minor[7]	3
Elective	9
	16

134 Total Semester Hours

[1]Students may schedule 6 hours from EX ST 301, MTHSC 104, 105, 106, 108 pursuant to score on the College Board Achievement Test in Mathematics, Level II and as approved by adviser.
[2]Preveterinary students should also schedule CH 223, 227.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]Preveterinary students may substitute PHYS 207 for PHYS 200.
[5]See General Education Requirements.
[6]Select 3 hours from the following: GEOG 101, 102, 301, HIST 101, 102, 172, 173, PO SC 101, 103, 105, PSYCH 201, R S (SOC) 359, 401, 471, SOC 201, 202.
[7]See adviser for list of minors.

POULTRY BUSINESS STUDIES

FRESHMAN YEAR

First Semester

AGRIC 105 Agriculture and Society	3
BIOL 103 General Biology I	4
ENGL 101 Composition I	3
P S 101 Avian Pets	1
Mathematics Requirement[1]	3
Social Science Requirement[3]	3
	17

Second Semester

AGRIC 104 Intro. to Plant Science	3
AGRIC 200 Agric. Appl. of Microcomputers	3
BIOL 104 General Biology II	4
ECON 200 Economic Concepts	3
ENGL 102 Composition II	3
	16

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3
AP EC 202 Agricultural Economics	3
MGT 200 Introduction to Business	3
P S 201 Poultry Husbandry	3
Agriculture Requirement[4]	3
Literature Requirement[2]	3
	18

P S 323 Poultry and Poultry Products Eval	2
Agriculture Requirement[4]	3
Business Requirement[6]	6
Humanities Requirement[5]	3
Elective	3
	17

JUNIOR YEAR

AP EC 302 Economics of Farm Management	3
LAW 312 Commercial Law	3
P S 451 Poultry Nutrition	2
SPCH 250 Public Speaking	3
Agriculture Requirement[4]	3
Business Requirement[6]	3
	17

ENGL 304 Business Writing	3
LAW 313 Commercial Law	3
MKT 301 Principles of Marketing	3
P S 355 Poultry Prod. Grading and Tech	3
Elective	4
	16

SENIOR YEAR

AP EC 309 Econ. of Agric. Marketing	3
EX ST 301 Introductory Statistics	3
MGT 301 Principles of Management	3
P S 458 Avian Micro. and Parasitology	4
P S 460 Seminar	1
Elective	3
	17

MGT 307 Personnel Management	3
P S 400 Avian Physiology	3
P S 402 Poultry Management	2
Business Requirement[6]	3
Elective	5
	16

134 Total Semester Hours

[1]Students may schedule 3 hours from MTHSC 101, 102, 104, 105, 106, 108 pursuant to score on the College Board Achievement Test in Mathematics, Level II and as approved by adviser.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]Select from history, political science, psychology, or sociology in the General Education Requirements.
[4]Select from AG E 333, 364, AG M 205, 301, ADVSC 202, 253, 255, 301, 310, 401, 402, 404, FD SC 201, 212, 305, 422, 424.
[5]See General Education Requirements.
[6]Select from accounting, agricultural and applied economics, finance, law, management, and marketing, as approved by adviser.

AQUACULTURE, FISHERIES, AND WILDLIFE BIOLOGY

Increased interest in and concern for conservation of natural resources and the environment and demand for seafood products and farm-raised fish has resulted in these areas becoming increasingly technical and requiring highly qualified wildlife and fisheries biologists. Greatest demands for graduates are in the following areas: management, research, survey and regulatory positions with state and federal agencies; industrial research and quality control laboratories; conservation, recreational, and other public service agencies; private enterprises and fish farms.

The undergraduate curriculum provides a solid foundation for many career opportunities in the sciences. The curriculum is strong in basic and applied sciences, communication skills and the social sciences. Twenty-seven credit hours may be selected from emphasis areas and elective course offerings. Students select an emphasis area in either aquaculture and fisheries, wildlife management, or preveterinary medicine. These allow students to expand their knowledge of aquaculture, fisheries and wildlife or to broaden their background with courses in botany, zoology, and other sciences. In addition, six semester credits are available for field training with appropriate natural resource agencies. Students can satisfy coursework requirements for professional certification by The Wildlife Society and/or the American Fisheries Society.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry[2]	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 102 Intro. to Math. Analysis	3	Mathematical Requirement[1]	3
W F B 101 Intro. to Aqua., Fisheries and Wildlife	1	Elective	3
W F B 102 Methods of Aqua., Fisheries and Wildlife	1		17
	16		

SOPHOMORE YEAR

AGRON 202 Soils	4	AGRIC 200 Agric. Appl. of Microcomputers	3
CH 201 Survey of Organic Chemistry	4	or Computer Science Requirement[3]	3
or BIOCH 210 Elem. Biochem	4	PHYS 200 Introductory Physics[4]	4
or CH 223 Organic Chemistry	3	Bioscience Requirement[6]	4
and CH 227 Organic Chem. Lab	1	Emphasis Area[5]	3
W F B 350 Principles of Fish and Wildlife Biology	3	Social Science Requirement[1]	3
Bioscience Requirement[6]	4		17
Elective	2		
	17		

JUNIOR YEAR

AG M 301 Soils and Water Conservation	3	AN PH 301 Physiology and Anatomy of Domestic Animals	4
ENGL 314 Technical Writing	3	EX ST 301 Introductory Statistics	3
W F B (BIOSC) 313 Conservation Biology	3	GEN 302 Introductory Genetics	4
Emphasis Area[5]	4	Social Science Requirement[1]	3
Humanities Requirement[1]	3	Wildlife and Fisheries Biology Requirement[7]	3
Elective	1		17
	17		

SENIOR YEAR

BIOSC 441 Ecology	4	W F B 499 Wildlife Biology and Fish Seminar	1
SPCH 250 Public Speaking	3	Emphasis Area[5]	7
Emphasis Area[5]	3	Humanities Requirement[1]	3
Wildlife and Fisheries Biology Requirement[7,8]	6	Wildlife and Fisheries Biology Requirement[8]	3
Elective	1	Elective	3
	17		17

135 Total Semester Hours

[1]See General Education Requirements.
[2]Students planning to take CH 223 should select CH 112.
[3]To be selected from computer science courses and total three or more credits.
[4]Preveterinary Medicine students must substitute PHYS 207.
[5]Select 17 credits from one of the three Emphasis Areas:
Aquaculture and Fisheries Adviser approves courses selected from agricultural and applied economics, biological sciences, botany, community and rural development, entomology, environmental science, environmental toxicology, forestry, geology, microbiology, wildlife and fisheries biology, zoology, etc.
Preveterinary Medicine ADVSC 202, BIOCH 301, 302, CH 224, 228, MICRO 305, NUTR 401, PHYS 208, or courses approved by the adviser. (See Preveterinary Medicine Requirements.)
Wildlife Biology Adviser approves courses from agricultural and applied economics, biological science, botany, community and rural development, environmental science, environmental toxicology, forestry, geology, microbiology, wildlife and fisheries biology, zoology, etc.
[6]Select 4 credits from either BIOSC 302 or 303 and 4 credits from either BIOSC 304 or 305.
[7]Select 6 credits from W F B 412, 414, 462.
[8]Select 6 credits from W F B 416, 450, 451, 452.

ENTOMOLOGY

Entomology, the study of insects, is a unique scientific discipline. Insects form the largest and most widely distributed class of animals in the world, including many of the most beneficial and harmful organisms known to man.

Exciting opportunities for professional entomologists are available in many areas, such as teaching and research, the cooperative extension service, pest control, pest management consulting, industry, the armed forces medical corps, public health agencies, and quarantine and regulatory agencies. This curriculum also provides an excellent foundation for graduate studies.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I	5	BIOL 111 Principles of Biology I	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 102 Intro. to Math. Analysis[1]	3	MTHSC 108 Calculus of One Variable II	4
or MTHSC 106 Calculus of One Variable I	4	or MTHSC 207 Multivariable Calculus	3
	15-16	Elective	3
			18-19

SOPHOMORE YEAR

AGRON 202 Soils	4	AP EC 202 Agricultural Economics	3
CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 227 Organic Chemistry Lab	1	GEN 302 Introductory Genetics	4
ENT 301 General Entomology	4	PHYS 200 Introductory Physics[4]	4
Foreign Language Requirement[3]	3	Foreign Language Requirement[3]	3
Humanities Requirement[2]	3		17
	18		

JUNIOR YEAR

ENT 405 Insect Morphology	4	ACCT 201 Principles of Accounting	3
ENT 468 Management Skills for Scientists	2	or EX ST 301 Introductory Statistics	3
SPCH 250 Public Speaking	3	ENT 410 Insect Taxonomy	3
Computer Science Requirement[5]	2	MICRO 305 General Microbiology	4
Humanities Requirement[2]	3	Entomology Requirement[6]	3
Elective	3	Elective	3
	17		16

SENIOR YEAR

BIOSC 441 Ecology	4	ENT 420 Toxicology of Insecticides	3
ENT 461 Directed Research in Entomology	1	ENT 462 Seminar	1
PL PA 401 Plant Pathology	3	ENT 470 Insect Physiology	3
Entomology Requirement[6]	3	Entomology Requirement[6]	3
Social Science Requirement[7]	3	Social Science Requirement[7]	3
Elective	3	Elective	3
	17		16

134 Total Semester Hours

[1]Students who fail to make a satisfactory score on the College Board Achievement Test in Mathematics, Level II, must schedule either MTHSC 104 or 105 in consultation with their advisers.
[2]See General Education Requirements.

[3]Two semesters of the same foreign language are required.
[4]Preveterinary Medicine students must substitute PHYS 207 and take PHYS 208 as a junior-year elective.
[5]Select from computer science courses or AGRIC 200 and total two or more credits.
[6]At least 6 credits must be selected from the following: ENT 401, 402, 403, 404, 455, 469.
[7]Select from anthropology, economics, geography, history, political science, psychology, or sociology (including crosslisted rural sociology courses).

FOOD SCIENCE

The Food Science major is designed to prepare students for the many career opportunities in technical and management areas of the food industry. The food industry, being the nation's largest industry, is becoming increasingly technical and requires large numbers of professional food scientists.

World food supplies, particularly those rich in protein, are becoming increasingly critical in many parts of the globe. This situation is expected to accelerate the demand for food scientists.

Opportunities for graduates in Food Science include research positions in government organizations and state experiment stations; supervisory, administrative, research and quality control positions in food processing industries; inspection and grading work with state and federal agencies; consulting, teaching and extension activities with universities and colleges.

Students graduating in Food Science are well prepared to pursue postgraduate training in areas such as microbiology, biochemistry, and nutrition, as well as in food science.

The student majoring in Food Science will select a minor, which will emphasize training in an area other than food science and which is designed to supplement the major course of study.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
or BIOL 110 Principles of Biology I	5	or BIOL 111 Principles of Biology II	5
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
FD SC 101 Man's Struggle for Food	1	MTHSC 106 Calculus of One Var. I	4
MTHSC 105 Precalculus[1]	5	Elective	2
	17-18		17-18

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	BIOCH 210 Elementary Biochemistry	4
and CH 227 Organic Chem. Lab	1	ENGL 231 Introduction to Journalism	3
or CH 201 Survey of Org. Chem	4	or ENGL 304 Business Writing	3
PHYS 122 Physics with Cal. I	3	FD SC 212 Man's Food Resources	2
or PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Literature Requirement[2]	3	or PHYS 221 Physics with Cal. II	3
Social Science Requirement[3]	3	and PHYS 223 Physics Lab. II	1
Elective	3	Social Science Requirement[3]	3
	16-17		16

JUNIOR YEAR

EX ST 301 Introductory Statistics	3	FD SC 422 Quality Assurance and Sensory Evaluation	2
FD SC 305 Dairy and Food Engr	3	FD SC 424 Quality Assurance and Sensory Evaluation Lab	1
MICRO 305 General Microbiology	4	MICRO 407 Food and Dairy Micro	4
NUTR 451 Human Nutrition	3	SPCH 250 Public Speaking	3
Humanities Requirement[4]	3	Minor[5]	3
Elective	1	Elective	4-3
	17		16-17

SENIOR YEAR

FD SC 401 Food Chemistry I	4	FD SC 402 Food Chemistry II	4
FD SC 403 Food Preservation and Processing I	3	FD SC 404 Food Preservation and Processing II	3
FD SC 405 Food Preservation and Processing Lab. I	1	FD SC 406 Food Preservation and Processing Lab. II	1
FD SC 417 Seminar	1	FD SC 418 Seminar	1
Minor[5]	6	Minor[5]	6
Elective	2	Elective	2
	17		17

134 Total Semester Hours

[1]Students who make a satisfactory score on the College Board Achievement Test in Mathematics, Level II must schedule other mathematics courses or electives in lieu of MTHSC 105 in consultation with adviser.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]AP EC 202 and a selection of 3 credits from the following: GEOG 101 or 102, HIST 101, 102, 172, 173, PO SC 101, PSYCH 201, R S (SOC) 401, SOC 201.
[4]At least 3 credits from art and architectural history, drama, humanities, foreign language literature (300-level or higher), music, philosophy, religion, or visual arts courses.
[5]See adviser for available minors and course requirements.

HORTICULTURE

Horticulture is the art, science, and business that deals with fruit and vegetable crops, ornamental plants, and turfgrasses and their production, utilization, and maintenance. A strong foundation in the basic sciences and humanities is necessary in all facets of horticulture. Undergraduate majors fulfill this need by taking courses in mathematics, chemistry, botany, physics, computer science, communications, economics, and humanities. Horticulture as a science depends equally upon such allied disciplines as plant pathology, plant physiology, entomology, forestry, agronomy and soils, agricultural engineering, and agricultural economics. Business electives contribute to the well-rounded curriculum. An ever expanding segment of horticulture involves the management of enterprises, from production to distribution and marketing. Horticulture as an art involves the arrangement of plants in an aesthetically pleasing fashion, whether as a floral centerpiece, an exterior landscape for a residence or building, or manicuring a golf green. All aspects of horticultural plants are the realm of the Horticulture major—growing, maintaining, selling, arranging, selecting.

The major in Horticulture broadly represents all crops and commodities. The Turfgrass option is sufficiently different so that it is listed separately. Even though broad training is required of all Horticulture majors, the opportunity exists to tailor one's courses around the traditional commodities (fruits, vegetables, nursery crops, landscape design, and floriculture) by the appropriate selection of electives within the major.

Enhancements allow the student to begin professional development while still enrolled as an undergraduate major. The opportunity to complete an internship in a horticultural enterprise is one enhancement that is strongly recommended. Students considering graduate school are advised to enhance their programs by taking optional courses in the basic sciences as well as by conducting an undergraduate research project. Persons with strong interests in a specific discipline may complete special problems under the direct supervision of an appropriate faculty member. The state-of-the-art computer laboratory in the Department of Horticulture and the integration of computer applications into most horticulture courses ensure that all students develop computer skills.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BOT 205 Plant Form and Function	4
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition	3	ENGL 102 Composition II	3
HORT 101 Horticulture	3	EX ST 301 Introductory Statistics	3
MTHSC 102 Introduction to Mathematical Analysis	3	or MTHSC 101 Finite Probability	3
	17	Social Science Requirement[1]	3
			17

SOPHOMORE YEAR

BOT 431 Intro. Plant Taxonomy	4	AGRON 202 Soils	4
CH 223 Organic Chemistry	3	AGRIC 200 Ag. Appl. of Microcomp	3
and CH 227 Organic Chemistry Lab	1	or CPSC 120 Intro. to Inform. Proc. Sys	3
or BIOCH 210 Elementary Biochemistry	4	HORT 208 Landscape Appreciation	3
or CH 201 Surv. of Org. Chem	4	PHYS 200 Introductory Physics	4
ENT 301 General Entomology	4	SPCH 250 Public Speaking	3
HORT 303 Plant Materials	3		17
Humanities/Literature Requirement	3		
	18		

JUNIOR YEAR

HORT 305 Plant Propagation	3	AG M 301 Soil and Water Conservation	3
HORT 456 Vegetable Crops	4	BOT 421 Plant Physiology	4
Horticulture Requirement[3]	3	ENGL 304 Business Writing	3
Humanities Requirement[2]	3	or ENGL 314 Technical Writing	3
Science Requirement[4]	4	HORT 310 Greenhouse Crop Physiology	3
	17	Business Requirement[5]	3
		Elective	1
			17

SENIOR YEAR

HORT 352 Tree Fruit Culture and Physiology	3	HORT 409 Seminar	1
or HORT 455 Small Fruit Crops	3	PL PA 401 Plant Pathology	3
HORT 412 Turf Management	3	Horticulture Requirement[3]	3
Horticulture Requirement[3]	3	Science Requirement[4]	3
Business Requirement[5]	3	Social Science Requirement[2]	3
Elective	6	Elective	3
	18		16

137 Total Semester Hours

[1]AP EC 202 or ECON 211.
[2]See General Education requirement.
[3]FOR 309, HORT 202, 304, 308, 352 or 455, 400, 406, 415, 416, 461, 462, 464, 470, HORT (AGRON) 433.
[4]Select with adviser's assistance, from the approved departmental list of upper-division courses as follows:
Group I Biological Sciences, genetics, microbiology. (Select at least 3 credits.)
Group II Agriculture, agronomy, integrated pest management, plant pathology
[5]Select from the departmental list of approved courses from accounting; agricultural and applied economics; law; management; marketing; and parks, recreation and tourism management. (See adviser.)

HORTICULTURE—TURFGRASS

The Turfgrass option has been carefully tailored for individuals who are interested in careers in the rapidly growing turfgrass industry. This option specifies courses in turfgrass management, pathology of turf and ornamental plants, agricultural mechanization, personnel management, soil fertility, soil microbiology, weed control, and park and recreation management. Graduates pursue careers in professional lawn-care establishment and maintenance of parks, athletic fields, and golf courses; production and sale of seed, sod, supplies, and equipment; or service as technicians for private businesses or government agencies.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BOT 205 Plant Form and Function	4
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HORT 101 Horticulture	3	EX ST 301 Introductory Statistics	3
MTHSC 102 Intro. to Math Analysis	3	or MTHSC 101 Finite Probability	3
	17	Social Science Requirement[1]	3
			17

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	AG M 205 Principles of Farm Shop	3
and CH 227 Org. Chem. Lab	1	AGRON 202 Soils	4
or CH 201 Survey of Org. Chemistry	4	ENGL 304 Business Writing	3
or BIOCH 210 Elem. Biochemistry	4	or ENGL 314 Technical Writing	3
HORT 303 Plant Materials	3	HORT 208 Landscape Appreciation	3
HORT 305 Plant Propagation	3	Humanities/Literature Requirement[1]	3
Business Requirement[5]	3		16
Social Science Requirement[2]	3		
Elective	1		
	17		

JUNIOR YEAR

ENT 301 General Entomology	4	AGRIC 200 Agric. Appl. of Microcomp	3
HORT 412 Turfgrass Management	3	or CP SC 120 Intro. to Inform. Proc. Sys	3
MGT 307 Personnel Management	3	BOT 421 Plant Physiology	4
SPCH 250 Public Speaking	3	PHYS 200 Introductory Physics	4
Science Requirement[4]	3	PL PA 401 Plant Physiology	3
	16	Horticulture Requirement[3]	3
			17

SENIOR YEAR

PL PA (ENT) 406 Diseases and Insects of Turfgrasses	3	AG M 301 Soil and Water Conservation	3
Horticulture Requirement[3]	3	HORT 409 Seminar	1
Humanities Requirement[1]	3	Horticulture Requirement[3]	3
Science Requirement[4]	4	Science Requirement[4]	3
Elective	4	Elective	7
	17		17

134 Total Semester Hours

[1]See General Education Requirements.
[2]AP EC 202 or ECON 211.
[3]FOR 309, HORT 202, 304, 308, 310, 352, 400, 406, 415, 416, 455, 456, 461, 462, 464, 470, HORT (AGRON) 433.
[4]Select, with adviser's assistance, from the departmental list of approved upper-division courses as follows:
Group I Biological sciences, genetics, microbiology. (Select at least 3 credits.)
Group II Agriculture, agronomy, integrated pest management, plant pathology.
[5]Select from the departmental list of approved upper-division courses from accounting; agricultural and applied economics; law; management; marketing; and parks, recreation and tourism management.

PACKAGING SCIENCE

Packaging Science is a discipline involving the use of materials, methods, and machinery to develop and produce packages that protect and preserve products, instruct the consumer in the product's proper use and help market the product. Environmental concerns are very important in packaging selection and design. Packaging is a large, international industry. On the basis of gross national product, it is the third largest industry in the United States. Packaging is an extremely dynamic, rapidly growing field. Virtually everything grown or manufactured is packaged in some fashion. The food industry is the largest user of packages, but nonfood packaging is essential also. Tamper-evident packaging is an integral part of the pharmaceutical industry, and packaging to prevent abuse of sensitive electronic equipment is assuming greater importance.

Opportunities for employment include a wide variety of career paths; i.e., marketing, manufacturing, research and development, design, transportation and distribution. Corporations which manufacture and sell packages as well as companies that purchase and use packages need well-educated and well-trained packaging personnel. If career interests lie in the regulatory field, interesting positions exist in state and federal governments; i.e., the Department of Agriculture and the Food and Drug Administration.

The student majoring in Packaging Science will select from two emphasis areas: Food Packaging and General Packaging. The basic curricula are the same, but students selecting the Food Packaging option are required to have

more food-related courses than those with the General Packaging option.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 105 Precalculus[1]	5	MTHSC 106 Calculus of One Var. I	4
PKGSC 101 Packaging Orientation	1	PKGSC 102 Intro. to Pkg. Science	2
	17	Elective	1
			18

SOPHOMORE YEAR

CH 201 Survey of Organic Chemistry	4	G C 104 Graphic Communications I	3
or CH 223 Organic Chemistry	3	PHYS 208 General Physics II[3]	4
and CH 227 Organic Chemistry Lab	1	PKGSC 204 Container Systems	2
CP SC 110 Elem. Computer Program[4]	3	PKGSC 206 Container Systems Lab	1
PHYS 207 General Physics I[3]	4	Emphasis Area[2]	3
PKGSC 200 Pkg. Materials and Mfg	2	Literature Requirement[5]	3
Emphasis Area[2]	5		16
	18		

JUNIOR YEAR

EX ST 301 Introductory Statistics	3	ENGL 304 Business Writing	3
MICRO 305 General Microbiology	4	IN ED 316 Plastics and Plastic Processes	3
PKGSC 368 Packaging and Society	3	SPCH 250 Public Speaking	3
Emphasis Area[2]	3	Emphasis Area[2]	3
Social Science Requirement[6]	3	Humanities Requirement[7]	3
Elective	2	Social Science Requirement[6]	3
	18		18

SENIOR YEAR

FD SC 401 Food Chemistry I	4	FD SC 464 Food Packaging Systems	3
FD SC 403 Food Preservation and Processing I	3	FD SC 466 Food Packaging Systems Lab	1
FD SC 405 Food Preservation and Processing Lab. I	1	PKGSC 404 Mechanical Properties of Materials and Principles of Package Evaluation	4
FD SC 417 Seminar	1	PKGSC 454 Packaging Evaluation Lab	2
Emphasis Area[2]	3	Emphasis Area[2]	4
Elective	4	Elective	3
	16		17

138 Total Semester Hours

[1]Students who make a satisfactory score on the Mathematics Test, Level II (Standard) may schedule other mathematics courses or electives in lieu of MTHSC 105, in consultation with adviser.
[2]See adviser.
[3]PHYS 122, 124, 221, and 223 may be substituted.
[4]CP SC 120 may be substituted.
[5]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[6]AP EC 202 and a selection of three credits from the following: GEOG 101 or 102, HIST 101, 102, 172, 173, PO SC 101, PSYCH 201, R S (SOC) 401; SOC 201.
[7]At least 3 credits from art and architectural history, drama, humanities, foreign language literature (300 level or higher), music, philosophy, religion, or visual arts courses.

PLANT PATHOLOGY

Plant pathology, the study of plant diseases, is a challenging biological and agricultural science. As a career, it is exciting, essential, and rewarding. As a profession, it requires ambition, skill, and dedication, while offering the opportunity for intellectual and personal fulfillment. Plant pathologists continually pit their abilities and energies against more than 50,000 destructive plant diseases.

Job opportunities include private consulting, cooperative extension services, agricultural sales, federal and state government and foreign service, technical work, biotechnology, various integrated pest-management programs, farming, and graduate programs. Salaries are competitive with other biological and agricultural professions.

Advisers for Plant Pathology undergraduates attempt to tailor the program of study to fit the student's long-term goals.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
or BIOL 110 Principles of Biology I	5	or BIOL 111 Principles of Biology II	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 102 Introduction to Mathematical Analysis	3	Elective	7
	14-15		18-19

SOPHOMORE YEAR

AGRIC 200 Agric. Appl. of Microcomp	3	AP EC 202 Agricultural Economics	3
AGRON 202 Soils	4	CH 224 Organic Chemistry	3
CH 223 Organic Chemistry	3	GEN 302 Introductory Genetics	4
CH 227 Organic Chemistry Lab	1	PHYS 200 Introductory Physics	4
ENT 301 General Entomology	4	Humanities Requirement[1]	3
Humanities Requirement[1]	3		17
	18		

JUNIOR YEAR

BIOCH 301 General Biochemistry	3	BOT 421 Plant Physiology	4
MICRO 305 General Microbiology	4	BOT 431 Introductory Plant Taxonomy	4
PL PA 401 Plant Pathology	3	PL PA 456 Plant Virology	3
Departmental Requirement[2]	3	SPCH 250 Public Speaking	3
Social Science Requirement[1]	3	Elective	3
	16		17

SENIOR YEAR

BOT 411 Introductory Mycology	4	PL PA 451 Bacterial Plant Pathogens	3
EX ST 301 Introductory Statistics	3	Departmental Requirement[2]	3
PL PA 458 Plant Parasitic Nematodes	3	Elective	12
Departmental Requirement[2]	3		18
Social Science Requirement[1]	3		
Elective	2		
	18		

135-137 Total Semester Hours

[1]See General Education Requirements.
[2]At least 9 credits must be selected from the following: AGRON 405, 407, 421, 422, 423, 425, 490, BIOCH 301, 423, 433, 434, CH 313, 317, ENT 401, 402, HORT 305, 352, 455, MICRO 416, PL PA 411, 412.

PREVETERINARY MEDICINE

Under a regional plan, the South Carolina Preveterinary Advisory Committee coordinates a program for all South Carolina residents who are interested in pursuing a career in veterinary medicine. South Carolina residents attending any college or university may apply through the South Carolina Advisory Committee to the University of Georgia College of Veterinary Medicine. Currently the University of Georgia admits up to seventeen students each year through arrangements with the Southern Regional Education Board.

Tuskegee University in Alabama has an excellent program in veterinary medicine. Application must be made directly to the Tuskegee University. Currently, Tuskegee admits four South Carolina residents.

Minimum requirements for admission to a college of veterinary medicine generally include the satisfactory completion of prescribed courses in a well-rounded undergraduate degree program. Specific requirements for admission to the University of Georgia College of Veterinary Medicine include the following undergraduate courses: six credits each of English and seven of physics, ten credits of biology and fourteen credits of organic and inorganic chemistry. (Chemistry and physics courses must be at the premedical level. They may not be survey courses.) In addition, three credits each of microbiology and biochemistry, including laboratories, and three credits of animal nutrition are required.

Further, the South Carolina Preveterinary Committee recommends that in order to be in the best possible competitive position, the applicant should complete courses in animal agriculture, genetics, nutrition, biochemistry, and advanced biology subjects. Considerations for selection are character, scholastic achievements, personality, experience with animals, general knowledge, and motivation. In the past, competition has been very keen and only those applicants who have shown exceptional ability have been admitted. Specific considerations may include a minimal grade-point average and completion of standardized tests such as the Graduate Record Examination and the Veterinary College Admission Test.

Since out-of-state students attending Clemson University are ineligible to apply to the University of Georgia or Tuskegee University under the South Carolina quota, they should contact the college(s) of veterinary medicine to which they plan to apply. They may apply at the University of Georgia for at-large admission.

Veterinary schools accept students with a broad range of academic backgrounds; therefore, it is recommended that the beginning university student select any undergraduate major and simultaneously complete the courses required for veterinary school entrance and those required for completion of a BS or BA degree. For students selecting Animal, Dairy and Veterinary Science, or Poultry Science in the College of Agricultural Sciences and Biological Sciences in the College of Sciences at Clemson University, the basic curricula have been designed to accommodate Georgia's entrance requirements. For further information, contact the chairperson of the Preveterinary Medicine Curriculum Committee.

COLLEGE OF ARCHITECTURE

The College of Architecture offers undergraduate degrees in the following areas:

1. The undergraduate design degree program (either the Bachelor of Arts in Design or the Bachelor of Science in Design) is the preprofessional preparation for two years of graduate study leading to the professional Master of Architecture degree, which is the fully accredited professional degree in this field.

2. The Bachelor of Science in Construction Science and Management program prepares students for careers as professional managers in the construction industry. A graduate program in Construction Science and Management is also offered in the College leading to the Master of Construction Science and Management.

3. The Fine Arts program offers professional study in the studio visual arts leading to the Bachelor of Fine Arts degree. A graduate program leading to the Master of Fine Arts is also offered.

4. The five-year Bachelor of Landscape Architecture degree program prepares students for careers as professional landscape architects.

5. A graduate program in City and Regional Planning is housed within the College and accepts graduates from a variety of baccalaureate programs and prepares them for careers in both public and private sector planning through its Master of City and Regional Planning degree.

The departments in the College hold membership in the Association of Collegiate Schools of Architecture, the Associated Schools of Construction, the Association of Collegiate Schools of Planning, the Council of Educators in Landscape Architecture, and the College Art Association of America. The College's professional programs are accredited by the National Architectural Accrediting Board, the Planning Accreditation Board, and the American Council for Construction Education.

In addition to the facilities housed in Lee Hall on the Clemson campus, the College offers students the opportunity to study at two off-campus sites:

1. The Clemson University College of Architecture Center at the College of Charleston is available to third- and fourth-year students for a semester's study in Charleston while earning credit from both Clemson University and the College of Charleston.

2. The Charles E. Daniel Center for Building Research and Urban Studies in Genoa, Italy provides graduate students from the College of Architecture a semester's residence in an intensive program of study and travel while earning full credit toward their degree.

ENTRANCE REQUIREMENTS

Admission to the College of Architecture is based on academic performance and is limited based on space availability in the various programs. Students wishing admission are advised to make application to the University Admissions Office early in the fall of their senior year in high school. They are also encouraged to schedule a personal interview in the College during their senior year, and if possible, bring a portfolio of their creative activities (except Construction Science and Management majors). Prospective students may schedule appointments by calling (803) 656-3081.

POLICY ON CHANGE OF MAJOR WITHIN OR INTO THE COLLEGE OF ARCHITECTURE

When space is available, a student may change majors to one of the programs in the College with a 2.5 cumulative grade-point average, at least 30 credit hours earned, and design aptitude evidenced by a portfolio review (except Construction Science and Management majors who must successfully complete with a C or better, CA DS 151 and 153 and C S M 100 during a summer session prior to being admitted) or approval of the department head. The first-year design courses (CA DS 151, 152, 153, and 154) are available to students transferring into the College during the two summer terms and are reserved for entering freshmen during the fall and spring semesters.

POLICY ON ADVANCEMENT IN DESIGN

Students enrolled in second-, third-, or fourth-year Design studios and theory courses must attain at least a 2.0 grade-point ratio in each year level (by repeating one or both semesters, if necessary) to qualify for advancement to the next year level or in the case of fourth-year Design studios, to qualify for the Design degree, or in Landscape Architecture at the fifth-year to qualify for the Bachelor of Landscape Architecture degree.

ARCHITECTURE

As a practicing professional, the architect has the creative responsibility of designing the buildings which shape our physical environment. To understand the humanistic, economic and technological nature of environmental problems the student must have a sound general education. Subsequent professional education must be preparation for a life of continuing change in which the problems to be solved will be large and small, for every sort of function, in every type of climate and for every condition of budget.

The curricula leading to the BA and BS in Design degree with studies in Architecture are conceived as fundamental parts of the prescribed sequence preparing students for the professional graduate degree, Master of Architecture. An effort is made to offer balanced general education offerings coordinated with an effective core of basic professional studies.

Students who have earned baccalaureate degrees in disciplines other than architecture, who wish to pursue a professional degree in Architecture, may be admitted through the graduate school as post-baccalaureate students. Students will remain in this category for such period of time as required to attain proficiency in the core courses required in the undergraduate Design program. Upon achieving this proficiency, the student may be admitted to the graduate program.

ARCHITECTURAL REGISTRATION/LICENSURE

Most states require that an individual intending to become an architect hold an accredited degree. There are two types of degrees that are accredited by the National Architectural Accrediting Board: (1) The Bachelor of Architecture, which requires a minimum of five years of study, and (2) the Master of Architecture, which requires a minimum of three years of study following an unrelated bachelor's degree or two years following a related

preprofessional bachelor's degree. These professional degrees are structured to educate those who aspire to registration/licensure as architects.

The four-year preprofessional degree, where offered, is not accredited by NAAB. The preprofessional degree is useful for those wishing a foundation in the field of architecture, as preparation for either continued education in a professional degree program, or for employment options in architecturally related areas.

ARCHITECTURE STUDIES

Degree: BA in Design

FRESHMAN YEAR

First Semester		Second Semester	
A A H 101 Survey of Art and Arch. Hist. I	3	A A H 102 Survey of Art and Arch. Hist. II	3
CA DS 151 Design Studies I	3	CA DS 152 Design Studies II	3
CA DS 153 Design Theory I	1	CA DS 154 Design Theory II	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I[1]	4	MTHSC 301 Stat. Theory and Methods I[1]	3
PHYS 207 General Physics I[2,3]	4	PHYS 208 General Physics II[2,3]	4
	18	Elective	1
			18

SOPHOMORE YEAR

A A H 203 Hist. and Theory of Arch. I	3	A A H 204 Hist. and Theory of Arch. II	3
CA AR 251 Design Studies III	5	CA AR 252 Design Studies IV	5
CA AR 253 Design Theory III	1	CA AR 254 Design Theory IV	1
C S M 201 Structures I	3	C S M 202 Structures II	3
ART[4]	3	ART[4]	3
Social Science Requirement[7]	3	Social Science Requirement[7]	3
	18		18

JUNIOR YEAR

CA AR 351 Design Studies V	5	CA AR 352 Design Studies VI	5
CA AR 353 Design Theory V	1	CA AR 354 Design Theory VI	1
C S M 301 Structures III	3	C S M 302 Structures IV	3
Literature Requirement[5]	3	English Requirement[6]	3
Modern Language[3]	4	Modern Language[3]	4
Elective	3	Elective	3
	19		19

SENIOR YEAR

CA AR 451 Design Studies VII	5	CA AR 452 Design Studies VIII	5
CA AR 453 Design Theory VII	1	CA AR 454 Design Theory VIII	1
C S M 304 Environmental Systems I	3	C S M 403 Environmental Systems II	3
Major Studies Requirement	3	Major Studies Requirement	6
Modern Language[3]	3	Modern Language[3]	3
Elective	3		18
	18		

146 Total Semester Hours

[1]A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301.
[2]With consent of adviser, BIOL 103, 104; CH 101, 102; GEOL 101, 102 may be substituted for PHYS 207 and 208.
[3]With consent of adviser, modern language may be taken in the freshman and sophomore years.
[4]ART 205, 207, 209, 211, 213, 215, 217, 219.
[5]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[6]ENGL 231, 304, 312, 314, SPCH 250.
[7]See General Education Requirements.
Note: MTHSC 105 will not count toward elective credit for a degree in Design.

ARCHITECTURE STUDIES

Degree: BS in Design

FRESHMAN YEAR

First Semester		Second Semester	
A A H 101 Survey of Art and Arch. Hist. I	3	A A H 102 Survey of Art and Arch. Hist. II	3
CA DS 151 Design Studies I	3	CA DS 152 Design Studies II	3
CA DS 153 Design Theory I	1	CA DS 154 Design Theory II	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I[1]	4	MTHSC 301 Stat. Theory and Methods I[1]	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
	18	Elective	1
			18

SOPHOMORE YEAR

A A H 203 Hist. and Theory of Arch. I	3	A A H 204 Hist. and Theory of Arch. II	3
CA AR 251 Design Studies III	5	CA AR 252 Design Studies IV	5
CA AR 253 Design Theory III	1	CA AR 254 Design Theory IV	1
C S M 201 Structures I	3	C S M 202 Structures II	3
ART[2]	3	ART[2]	3
Social Science Requirement[5]	3	Social Science Requirement[5]	3
	18		18

JUNIOR YEAR

CA AR 351 Design Studies V	5	CA AR 352 Design Studies VI	5
CA AR 353 Design Theory V	1	CA AR 354 Design Theory VI	1
C S M 301 Structures III	3	C S M 302 Structures IV	3
Major Studies Elective	3	Major Studies Requirement	3
Literature Requirement[3]	3	English Requirement[4]	3
Elective	3	Elective	3
	18		18

SENIOR YEAR

CA AR 451 Design Studies VII	5	CA AR 452 Design Studies VIII	5
CA AR 453 Design Theory VII	1	CA AR 454 Design Theory VIII	1
C S M 304 Environmental Systems I	3	C S M 403 Environmental Systems II	3
Major Studies Requirement	6	Major Studies Requirement	9
Elective	3		18
	18		

144 Total Semester Hours

[1]A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301.
[2]ART 205, 207, 209, 211, 213, 215, 217, 219.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]ENGL 231, 304, 312, 314, SPCH 250.
[5]See General Education Requirements.
Note: MTHSC 105 will not count toward elective credit for a degree in Design.

FINE ARTS

The Bachelor of Fine Arts degree is offered to a limited number of students interested in a balanced curriculum of academic coursework with studio art and art history courses. It is the recognized professional degree in the visual arts leading to careers in the visual arts that demands study in the areas of drawing, painting, sculpture, printmaking, photography, and ceramics.

Students begin to concentrate their studio coursework in a specific area of the visual arts in the junior year in preparation for their senior studio. The senior studio is the most significant coursework in the undergraduate curriculum as it is a time in which concepts and skills are focused and developed to produce a cohesive body of artwork and a portfolio for graduate study and professional application.

FRESHMAN YEAR

First Semester		Second Semester	
A A H 101 Survey of Art and Architectural History I	3	A A H 102 Survey of Art and Architectural History II	3
ART 205 Beginning Drawing	3	ART 207 Beginning Painting	3
CA DS 151 Design Studies I	3	CA DS 152 Design Studies II	3
CA DS 153 Design Theory I	1	CA DS 154 Design Theory II	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 101 Finite Probability[1]	3	MTHSC 102 Introduction to Mathematical Analysis[1]	3
	16		16

SOPHOMORE YEAR

A A H 205 History and Theory of Art I	3	A A H 206 History and Theory of Art II	3
ART 209 Beginning Sculpture	3	ART 213 Beginning Photography	3
ART 211 Beginning Printmaking	3	ART 217 Beginning Ceramics	3
Applied Science Requirement[5]	3	ART 305 Drawing	3
Science/Laboratory	4	Science/Laboratory	4
	16		16

JUNIOR

A A H 305 Contemporary Art History	3	MUSIC 210 Music Appreciation	3
ART 300/400	6	ART 300/400	6
Literature Requirement[2]	3	Communications Requirement[3]	3
Studio Requirement[4]	3	Studio Requirement[4]	3
Elective	3	Elective	3
	18		18

SENIOR YEAR

ART 471 BFA Senior Studio I	5	ART 472 BFA Senior Studio II	5
ART 300/400	3	ART 300/400	3
Social Science Requirement[5]	3	Social Science Requirement[5]	3
Studio Requirement[4]	3	Studio Requirement[4]	3
Elective	3	Elective	3
	17		17

134 Total Semester Hours

[1]Students may pursue alternate sequences as follows: MTHSC 101 and 203 , 102 and 207, or 106 and 301.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]ENGL 231, 304, 312, 314, SPCH 250.
[4]All visual arts courses and other courses approved by the adviser.
[5]See General Education Requirements.

CONSTRUCTION SCIENCE AND MANAGEMENT

As the largest single industry in the United States and one of the most important, construction offers unlimited opportunities to highly motivated and professionally educated young men and women. Future professionals must be skilled in managing people, equipment, and capital, coupled with a grasp of construction materials and methods and the complex technologies of modern construction. The Bachelor of Science in Construction Science and Management curriculum is the basis for either a career in construction or as a developer or building management specialist.

FRESHMAN YEAR

First Semester		Second Semester	
A A H 101 Survey of Art and Architectural History I	3	A A H 102 Survey of Art and Architectural History II	3
CA DS 151 Design Studies I	3	C S M 100 Introduction to Construction Science and Management	4
CA DS 153 Design Theory I	1	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 301 Statistical Theory and Methods I[1]	3
MTHSC 106 Calculus of One Variable I[1]	4	PHYS 208 General Physics II	4
PHYS 207 General Physics I	4	Elective	1
	18		18

SOPHOMORE YEAR

CP SC 120 Intro. to Info. Processing Sys.	3	C E 201 Surveying	3
C S M 201 Structures I	3	C S M 202 Structures II	3
C S M 203 Mats. and Methods of Const.	3	C S M 204 Contract Documents	3
ECON 211 Principles of Microeconomics	3	ECON 212 Principles of Macroeconomics	3
Literature Requirement[3]	3	Speech Requirement[6]	3
Elective	3	Elective	3
	18		18

JUNIOR YEAR

C S M 301 Structures III	3	ACCT 203 Financial Accounting	3
C S M 351 Construction Estimating I	3	C S M 302 Structures IV	3
MGT 307 Personnel Management	3	C S M 303 Soils and Foundations	3
ART[2]	3	C S M 304 Environmental Systems I	3
English Requirement[4]	3	C S M 352 Construction Scheduling	3
Elective	3	LAW 322 Legal Environ. of Business	3
	18		18

SENIOR YEAR

C S M 401 Formwork and Placing Concrete	3	C S M 402 Construction Equipment and Safety Mgt.	3
C S M 453 Construction Project Management	3	C S M 454 Construction Capstone	6
C S M 461 Construction Economics Seminar	3	C S M 491 Construction Science and Mgt. Internship	0
Major Requirement[5]	6	Major Requirement[5]	6
	15		15

138 Total Semester Hours

[1]A sequence of MTHSC 101, 102 and 203 will be accepted in lieu of MTHSC 106 and 301.
[2]ART 205, 207, 209, 211, 213, 215, 217, 219.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]ENGL 231, 304, 312, 314, SPCH 250.
[5]Select from approved departmental list or as approved in writing by adviser and department head.
[6]SPCH 150, 250.
Notes:
1. A minimum grade of C is required in each of the following courses: C S M 203, 204, 303, 304, 351, 352, 353, 401, 402, 453, 454, 461.
2. A minimum of 800 hours of construction experience will be required prior to graduation.

LANDSCAPE ARCHITECTURE

Landscape architecture derives from the application of aesthetic, cultural, and scientific knowledge to the solution of problems of functional use of the land. Studio offerings at Clemson will stimulate broad problem precepts and help develop methodologies to be exercised in their solution. Landscape architecture embraces aspects of allied professions, including architecture, civil engineering, and horticulture and draws on the areas of ecology, geology, sociology, hydrology, forestry, and other social, natural, and applied sciences. This five-year program leads to the professional degree, Bachelor of Landscape Architecture.

FRESHMAN YEAR

First Semester		Second Semester	
A A H 101 Survey of Art and Arch. Hist. I	3	A A H 102 Survey of Art and Arch. Hist. II	3
CA DS 151 Design Studies I	3	CA DS 152 Design Studies II	3
CA DS 153 Design Theory I	1	CA DS 154 Design Theory II	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 102 Intro. to Math. Analysis	3	EX ST 301 Introductory Statistics[2]	3
Science with Laboratory[1]	4	Science with Laboratory[1]	4
	17	Elective	1
			18

SOPHOMORE YEAR

A A H 203 Hist. and Theory of Arch. I	3	A A H 204 Hist. and Theory of Arch. II	3
CA AR 251 Design Studies III	5	CA AR 252 Design Studies IV	5
CA AR 253 Design Theory III	1	CA AR 254 Design Theory IV	1
C S M 201 Structures I	3	LARCH 262 Landscape Arch. Tech. I	3
HORT 303 Plant Materials	3	Art Requirement[6]	3
Art Requirement[6]	3	Horticulture Requirement[10]	3
	18		18

JUNIOR YEAR

A A H 416 History of Landscape Architecture	3	LARCH 352 Landscape Architecture Design II	6
LARCH 351 Landscape Architecture Design I	6	LARCH 362 Landscape Architecture Tech. II	3
Horticulture Requirement[10]	3	English Requirement[5]	3
Social Science Requirement[3]	3	Social Science Requirement[3]	3
Literature Requirement[4]	3	Elective	2
	18		17

SENIOR YEAR[8]

LARCH 451 Landscape Architecture Design III	6	HORT 461 Problems in Landscape Design IV	4
LARCH 462 Landscape Architectural Tech. III	3	LARCH 452 Landscape Architecture Design IV	6
Professional Support Requirement[7]	3	Professional Support Requirement[7]	6
Elective	3		16
	15		

PROFESSIONAL YEAR

Professional Support Elective[7, 9]	15	LARCH 552 Prof. Landscape Arch. Design	6
	15	LARCH 562 Landscape Arch. Tech. IV	2
		LARCH 581 Landscape Architectural Prof. Practice	3
		Elective	4
			15

167 Total Semester Hours

[1]BIOL 103 and 104, GEOL 101/103 and 102/104, CH 105, 106, and PHYS 207, 208.
[2]MTHSC 301 may be taken in lieu of EX ST 301.
[3]See General Education Requirements.
[4]ENGL 202, 203, 204, 205, 206, 207, 208, 209 or 300/400 level foreign language literature.
[5]ENGL 231, 304, 312, 314, 316, SPCH 250.
[6]ART 205, 207, 209, 211, 213, 215, 217, 219.
[7]See adviser.
[8]Students may petition to graduate at the end of their senior year with a subprofessional BA or BS in Design degree. Students earning credit for four semesters of the same modern language may elect to receive the BA in Design. Note that only one degree in Design will be awarded.
[9]Exceptional students may be permitted to spend this semester at the Daniel Center in Genoa, Italy.
[10]HORT 101, 208, 304, 305, 308, 412, 415, 462.

COLLEGE OF COMMERCE AND INDUSTRY

The programs of the College of Commerce and Industry embrace three major areas: teaching, research, and public service. The College is responsible for eight graduate programs (two in cooperation with other administrative units), ten undergraduate programs, and a series of professional development courses for business and industry. The undergraduate curricula are in the areas of Accounting, Economics, Financial Management, Industrial Management, Management, Marketing, Textile Chemistry, Textile Science, and Textile Management. These curricula are designed to prepare the student for a variety of careers, as well as to furnish an education on which to build for a lifetime. The curricula recognize the need for an understanding of the basic principles of science and appreciation for the nature of human interaction, and the comprehension of the economic, political, and social environment. Flexibility in course selection and choice of areas for emphasis is made possible by secondary concentrations and minors as indicated.

ACCOUNTING

The Bachelor of Science degree in Accounting is designed to develop the capability of students to become professional accountants. For some accounting specialties this implies preparation for entry-level positions; for other specialties this implies preparation for further study of accounting at the graduate level. This curriculum also provides excellent preparation for students interested in entry-level management positions or graduate study in business or law. In addition to accounting and business courses, approximately one-half of the curriculum is devoted to English and public speaking, mathematics, natural and social sciences, and the humanities. Students are thus provided with a broad-based education. Beyond the general business accreditation held by the College of Commerce and Industry, the degree programs offered by the School of Accountancy are separately accredited by the American Assembly of Collegiate Schools of Business.

Students desiring to enter the profession of public accountancy with the intention of becoming a Certified Public Accountant should be aware that as of July 1, 1997, the requirements to sit for the CPA examination in South Carolina include 150 hours of collegiate education and completion of a bachelor's degree. Other states have, or will soon have, similar requirements. The faculty of the School of Accountancy believes these requirements are best met with a bachelor's degree in accounting and completion of the Master of Professional Accountancy (MPAcc) degree program. The MPAcc degree program also enhances the preparation of students pursuing accounting careers in other areas of specialization such as internal auditing, managerial accounting, and taxation.

Admission to the MPAcc program is separate from admission to the undergraduate program. It is based on the student's undergraduate record and score on the Graduate Management Admissions Test (GMAT). For information on the MPAcc program contact the School of Accountancy, 301 Sirrine Hall.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 111 Principles of Macroeconomics	3	CP SC 120 Intro. to Infor. Proc. Sys.	3
ENGL 101 Composition I	3	ECON 112 Principles of Macroeconomics	3
MTHSC 102 Intro. to Math. Analysis[1]	3	ENGL 102 Composition II	3
PSYCH 201 Introduction to Psychology	3	MTHSC 207 Multivariable Calculus[1]	3
or SOC 201 Introduction to Sociology	3	Laboratory Science Sequence[2]	4
Laboratory Science Sequence[2]	4		16
	16		

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
HIST 170 or 171 Western Civilization	3	ACCT 204 Accounting Procedures	1
MTHSC 301 Stat. Theory and Meth. I	3	CP SC 270 Fundamentals of Information Systems	4
or EX ST 301 Introductory Statistics	3	MA SC 372 Decision Models for Management	3
PO SC 101 Introduction to American Politics	3	PHIL 103 Introduction to Logic	3
or PO SC 103 Intro. to Government and Politics	3	SPCH 250 Public Speaking	3
or PO SC 105 Intro. to International Politics	3		17
Fine Arts Requirement[3]	3		
Literature Requirement[3]	3		
	18		

JUNIOR YEAR

ACCT 301 Intermediate Accounting	3	ACCT 302 Intermediate Accounting	3
ACCT 322 Accounting Information Systems	3	ACCT 340 Internal Auditing Theory	3
ENGL 304 Business Writing	3	or ACCT 435 Auditing[2]	3
FIN 311 Financial Management I	3	FIN 312 Financial Management II	3
MGT 301 Principles of Management	3	MGT 301 Principles of Marketing	3
Elective[4]	1	Literature/History Requirement[3]	3
	16	Elective[4]	3
			18

SENIOR YEAR

ACCT 303 Cost Accounting	3	ACCT 404 Individual Taxation[5]	3
LAW 312 Commercial Law	3	or ACCT 406 Business Taxation	3
PHIL 344 Business Ethics	3	ACCT 410 Budgeting and Executive Control	3
Business/Computer Science Requirement[6]	3	LAW 313 Commercial Law	3
Elective[4]	3	MGT 415 Business Strategy	3
	15	Elective[4]	3
			15

131 Total Semester Hours

[1]Either MTHSC 102 and 207 or 106 and 108 may be taken to satisfy the freshman mathematics requirement. Elective credits are used to satisfy the difference in hours.

[2]A two-semester sequence including laboratories, to be selected from the following: ASTR 101/103 and 102/104; BIOL 103 and 104; CH 101 and 102; CH 105 and 106; GEOL 101/103 and 102/104; or PHYS 207 and 208.

[3]ENGL 203, 204, 205, 206.

[4]AAH 210, MUSIC 210, THEA 210

[5]Elective credits may be taken in any combination of 1-, 2-, 3-, or 4-credit courses, but see footnote 1 above.

[6]Students planning to pursue the Master of Professional Accountancy degree program should take ACCT 404 and 415.

[7]ENGL 207, 208, HIST 270, 272, 273, 274, 275, 277, 278, 390, 391.

[8]To be selected with the consent of the adviser from courses offered by the School of Accountancy or the following departments: Economics, Finance, Management, Marketing, or Computer Science. Students desiring to complete the internal audit sequence should select ACCT 445 with these hours.

Notes:

1. MTHSC 101, 104 or 105 may not be counted in computing the minimum number of credits required for graduation with a BS in Accounting degree.
2. Students must earn a C in all prerequisite accounting courses before enrolling in the next level accounting course. Courses in which this rule applies are ACCT 201, 202, 204, 301, 302.

ECONOMICS

A bachelor's degree in Economics provides a thorough understanding of the economic system and prepares the student for a broad choice of career opportunities. By combining general education courses, a minor or option, and a strong major in economics, students can prepare themselves for specialized graduate studies and careers in business and government.

The Department of Economics offers two degree paths for the undergraduate. The Bachelor of Arts degree is distinguished by its emphasis on the language skills and the humanities. A broad choice of minors is available for

this program. The Bachelor of Science program emphasizes quantitative skills and particular preparations for careers in business and offers a structured selection of options.

BACHELOR OF ARTS IN ECONOMICS

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 110 Elem. Comp. Prog.	3	ENGL 102 Composition II	3
or CP SC 120 Intro. to Inf. Proc. Sys.	3	HIST 172 Western Civilization	3
ENGL 101 Composition I	3	MTHSC 101 Finite Probability[1]	3
MTHSC 102 Intro. to Math. Analysis[1]	3	Modern Language[6]	4
Modern Language[6]	4	Science Requirement[2]	4
Science Requirement[2]	4	Elective	1
Elective	1		18
	18		

SOPHOMORE YEAR

ECON 211 Principles of Microeconomics	3	ECON 212 Principles of Macroeconomics	3
HIST 173 Western Civilization	3	MTHSC 207 Multivariable Calculus[1]	3
MTHSC 208 Elem. Stat. Inference[1]	3	Literature Requirement[3]	3
Literature Requirement[3]	3	Modern Language[6]	3
Modern Language[6]	3	Social Science Requirement[4]	3
Elective	1	Elective	2
	16		17

JUNIOR YEAR

ACCT 200 Basic Accounting	3	ECON 315 Intermediate Macroeconomics	3
or ACCT 201 Principles of Accounting	3	Social Science Requirement[4]	3
ECON 314 Intermediate Microeconomics	3	Major[5]	3
ENGL 304 Business Writing	3	Minor	6
or SPCH 250 Public Speaking	3		15
Major[5]	3		
Minor	3		
	15		

SENIOR YEAR

Major[5]	6	Major[5]	6
Minor	6	Elective	10
Elective	3		16
	15		

130 Total Semester Hours

[1]The sequence MTHSC 101, 102, 203, 207 may be replaced either by MTHSC 102, 207, 210, 301 or 106, 207, 210, 301.
[2]Two courses, totaling eight hours, in the same science are required.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]See General Education Requirements.
[5]Twenty-four semester hours in economics above the sophomore level are required, including ECON 314 and 315. Major credit may include up to 6 hours selected from HIST 325, I E 384, MGT 406. (Those seeking teaching certification will be required to complete more than 130 semester hours.)
[6]Two years of the same language are required.

MINOR CONCENTRATION

Any minor approved by the College of Liberal Arts, including the Cluster minor, and any minor concentration offered by any other department in the College of Commerce and Industry is acceptable as a minor for the Bachelor of Arts curriculum in Economics.

Students who wish to combine the curriculum in Economics with secondary school teaching should elect to take the degree in Education with a teaching area in Economics. The courses will be those required for teaching certification as specified by the South Carolina Department of Education as well as those required for an Economics major. Requirements for a major in Education with a teaching area in Social Sciences are shown under the College of Education.

A minor in Economics is provided for other degree programs consisting of 15 hours above the sophomore level which must include ECON 314 and 315.

BACHELOR OF SCIENCE IN ECONOMICS

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 106 Calculus of One Variable I[1]	4	MTHSC 207 Multivariable Calculus[1]	3
Science Requirement[2]	4	Science Requirement[2]	4
Social Science Requirement[15]	3	Social Science Requirement[15]	3
	17	Elective	1
			17

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
CP SC 110 Elem. Comp. Prog.	3	ECON 212 Principles of Macroeconomics	3
or CP SC 120 Intro. to Inf. Proc. Sys[4]	3	FIN 306 Corporation Finance[14]	3
ECON 211 Principles of Microeconomics	3	MTHSC 210 Applied Matrix Alg.[1]	3
MTHSC 301 Stat. Theory and Meth. I[1]	3	Literature Requirement[3]	3
Literature Requirement[3]	3	Elective	1
Elective	1		16
	16		

JUNIOR YEAR

ECON 314 Intermediate Microeconomics	3	ECON 315 Intermediate Macroeconomics	3
LAW 322 Legal Envir. of Bus.[7]	3	ENGL 304 Business Writing	3
or LAW 312 Commercial Law	3	or SPCH 250 Public Speaking	3
Major[6]	3	Major[6]	3
Option	3	Option	3
Elective	4	Elective	3
	16		15

SENIOR YEAR

Major[6]	6	Major[6]	6
Option	6	Option	3-5
Elective	6	Elective	6-8
	18		17

132 Total Semester Hours

OPTIONS

Rather than having a minor or secondary concentration as in the Bachelor of Arts program in Economics, a student in the Bachelor of Science program selects one of several options. These options generally consist of 15 hours of a certain core of study. It is felt that these options might be particularly appealing to certain students with definite vocational interests. In addition, an appropriately chosen option would greatly facilitate moving into a Master of Business Administration program in graduate school or law school.

Students enrolling in the Bachelor of Science program in Economics may select from the following options.

Accounting[7]		Management Science[7]	
ACCT 301 Intermediate Accounting	3	ACCT 303 Cost Accounting	3
ACCT 302 Intermediate Accounting	3	or ACCT 404 Individual Taxation	3
ACCT 303 Cost Accounting	3	or LAW 313 Commercial Law	3
and ACCT 404 Individual Taxation	3	ECON 405 Introduction to Econometrics	3
or ACCT 411 Financial Accounting Problems	3	MA SC 413 Management Science I	3
and ACCT 415 Auditing	3	Quantitative Requirement[8]	6
LAW 313 Commercial Law	3		15
	15		

Computer Science
Select at least 15 hours from the following:
ECON 405 Introduction to Econometrics 3
MGT 299 Computer Utilization 1
MGT 418 Management Inform. Sys 3
and MGT 399 Mgt. Applic. of Microcomputers 2
Computer Science Requirement[10] .....
15

Environmental Studies
AP EC 403 Land Economics 3
C R D 357 Natural Resources Economics 3
EN SC 200 Intro. to Environmental Science 3
EN SC 400 Studies in Environmental Science 3
EN SC 471 Man and His Environment 2
FOR 304 Forest Resource Economics 3
17

Social Science
HIST 325 American Economic Development 3
PO SC 321 General Public Administration 3
or PO SC 361 International Politics in Crisis 3
SOC 330 Industrial Sociology 3
Elective[5] 6
15

International Management[11]
MGT 301 Principles of Management 3
MGT 400 Management of Org. Behavior 3
or MGT 415 Business Strategy 3
or MGT 423 International Business Mgt 3
PO SC 361 International Politics in Crisis 3
Modern Language[12] 8
17

Law and Economics[7]
ECON 309 Government and Business 3
or ECON 420 Public Sector Econ 3
or ECON 424 Organization of Industries 3
LAW 312 Commercial Law 3
LAW 313 Commercial Law 3
LAW (ECON) 402 Law and Economics 3
PO SC 432 American Constitutional Law I 3
15

Mathematical Sciences–Statistics
ECON 405 Introduction to Econometrics 3
ECON 430 Mathematical Economics 3
MTHSC 311 Linear Algebra 3
MTHSC 405 Statistical Theory and Methods II 3
MTHSC 440 Linear Programming 3
15

Public Administration[9]
Select 15 hours from the following:
PO SC 302 State and Local Government 3
PO SC 321 General Public Administration 3
PO SC 405 Presidential Leadership 3
PO SC 422 Government Policy and Pol. Economy 3
PO SC 423 Urban Politics 3
PO SC 425 Money, Budgets, and Grantsmanship 3
PO SC 427 Public Personnel Management 3
21

Textile Science
TEXT 201 Yarn Structures and Formation 4
TEXT 202 Fabric Structures, Design, and Analysis 4
TEXT 314 Chemical Processing of Textiles 4
TEXT 460 Textile Processes 3
TEXT 475 Textile Marketing 3
18

Finance[14]
FIN 312 Financial Management II 3
Finance Requirement[16] 12
15

Marketing
MKT 301 Principles of Marketing 3
MKT 302 Consumer Behavior 3
MKT 431 Marketing Research 3
Marketing Requirement[13] 6
15

[1]The sequence of MTHSC 106, 207, 210, 301 may be replaced by MTHSC 102, 207, 210, 301 or 101, 102, 203, and 207.
[2]Two courses, totaling 8 credits in the same science, are required.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]CP SC 110 should be selected for the Computer Science and Mathematical Sciences—Statistics options. CP SC 120 should be selected for the Management Science and Accounting options.
[5]Select from 300- and 400-level courses in geography, history, political science, psychology, and sociology.
[6]Twenty-four hours in economics above the sophomore level are required including ECON 314 and 315. Major credit may include up to 6 credits selected from HIST 325, I E 384, MGT 406.
[7]Students in either the Accounting or the Management Science option should select LAW 312 in lieu of LAW 322 in the junior year, while those in the Law and Economics option are required to take LAW 322.
[8]Select from ECON 430, ECON (MGT) 409, MA SC 414, MTHSC 405.
[9]Students in the Public Administration option are required to take PO SC 101 and 103; ECON 309 and 420 are to be included in the major.
[10]Select from any 200, 300 or 400-level computer science courses.
[11]Students in the International Management option are required to take PO SC 101, 103; ECON 412 is to be included in the major.
[12]Two semesters of the same language are required.
[13]Select from AP EC 351 or any 400-level marketing course.
[14]Students in the Finance option should select FIN 311 in lieu of FIN 306 during the sophomore year.
[15]See General Education Requirements and footnotes 9 and 11 above.
[16]Select from 300 and 400 level finance courses.

FINANCIAL MANAGEMENT

The degree program for the Bachelor of Science in Financial Management is accredited by the American Assembly of Collegiate Schools of Business.

The curriculum provides the student with a course of study in preparation for a career in such areas as corporate finance, banking, insurance, brokerage, real estate financing, and investment services. The student should be well prepared to serve on the financial staff of practically any business firm

for the purpose of planning, providing, and controlling the capital of the firm. This curriculum should also prepare the student for service with government agencies and programs. The graduate with this degree should be well prepared for entrance into Master of Business Administration, Law, or other graduate programs.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 211 Principles of Microeconomics	3	CP SC 120 Intro. to Info. Process Sys.	3
ENGL 101 Composition I	3	ECON 212 Principles of Macroeconomics	3
MTHSC 102 Intro. to Math. Analysis[1]	3	ENGL 102 Composition II	3
Laboratory Science Requirement[2]	4	MTHSC 207 Multivariable Calculus[1]	3
Social Science Requirement[2]	3	Laboratory Science Requirement[2]	4
Elective	1		16
	17		

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
MTHSC 301 Stat. Theory and Meth. I	3	ACCT 204 Accounting Procedures	1
PHIL 344 Business Ethics	3	ENGL 304 Business Writing	3
SPCH 250 Public Speaking	3	MA SC 310 Intro. to Management Science	3
Literature Requirement[3]	3	PSYCH 201 Introduction to Psychology	3
Elective	3	Elective	3
	18		16

JUNIOR YEAR

ACCT 301 Intermediate Accounting	3	ACCT 302 Intermediate Accounting	3
ECON 302 Money and Banking	3	FIN (ECON) 305 Investment Analysis	3
FIN 307 Principles of Real Estate	3	FIN 308 Financial Institutions and Mkts	3
FIN 311 Financial Management I	3	FIN 312 Financial Management II	3
MGT 301 Principles of Management	3	LAW 312 Commercial Law	3
	15		15

SENIOR YEAR

FIN 411 International Financial Management	3	MGT 415 Business Strategy	3
MGT 390 Operations Management	3	Concentration Area[5]	9
MKT 301 Principles of Marketing	3	Elective	3
Accounting Requirement[4]	3		15
Concentration Area[5]	6		
	18		

130 Total Semester Hours

[1]Credits earned in MTHSC 106 and 108 may be substituted for MTHSC 102 and 207, respectively, and 1 or 2 elective hours.

[2]See General Education Requirements.

[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209, or 300-level foreign language literature.

[4]Accounting requirement may be selected from any 300- or 400-level course offered by the School of Accountancy. Credit may not be received for both ACCT 303 and 307.

[5]Fifteen credits from one of the following Concentration Areas along with its corresponding courses. (A Concentration Area should be selected by the end of the second semester of the student's Junior year in consultation with adviser.)

Accounting FIN 402, 404, and three accounting electives. (See footnote 4 below.)

Corporate Finance FIN 402, 404, 405 or 406 or 408; and two Business Electives. (See note 3 below.)

Financial Institutions FIN 405, 408, 304 or 406 or 417; and two Business Electives. (See note 3 below.)

International Finance FIN 406, MGT 423, MKT 427, and two courses in a foreign language. (See note 3 below.)

Investments ACCT 404, FIN 304, 405, 406, MKT 428.

Real Estate AP EC 313, FIN 417, LAW 333, and two electives from the Department of Finance approved list.

Notes:

1. Financial Management majors are required to have a grade-point ratio of at least 2.0 in all FIN-designated courses in order to graduate. Only the last grade for courses that are repeated counts for computing the grade-point ratio.
2. No more than 60 percent of coursework may be taken in the College of Commerce and Industry.
3. Business Electives may be selected from any 300- or 400-level course offered by the College of Commerce and Industry or from any computer science course.
4. MTHSC 101 may not be used as elective credit toward requirements for graduation with a BS in Financial Management.

INDUSTRIAL MANAGEMENT

The Bachelor of Science degree in Industrial Management is designed primarily to prepare students for management challenges in the areas of

manufacturing, production planning, inventory control, quality assurance, and service operations. Industrial management students receive a broad-based education in business, but particular emphasis is placed on systems, theories, and issues dealing with the production of goods and services. The Industrial Management program is particularly relevant in today's economic environment, where improvements in productivity and quality are essential to meet the growing challenges of foreign producers in many industries. In addition to jobs in manufacturing management, graduates of the Industrial Management program are sometimes sought for positions as project directors by various government agencies and research centers. Banks and financial institutions have found the industrial management graduate well prepared for internal operations management as well as for liaison positions dealing with manufacturing companies as bank customers. The Industrial Management program is accredited by the American Assembly of Collegiate Schools of Business and has received a special commendation for excellence from the South Carolina Commission on Higher Education.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 211 Principles of Microeconomics	3	CP SC 120 Intro. to Infor. Proc. Sys.	3
ENGL 101 Composition I	3	ECON 212 Principles of Macroeconomics	3
MTHSC 106 Calculus of One Variable I	4	ENGL 102 Composition II	3
Science Requirement[1]	4	MTHSC 108 Calculus of One Variable II	4
Social Science Requirement[2]	3	Science Requirement[1]	4
	17		17

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
MTHSC 301 Stat. Theory and Meth. I	3	LAW 322 Legal Environ. of Business	3
PHIL 344 Business Ethics	3	MA SC 310 Intro. to Management Science	3
Literature Requirement[3]	3	MGT 299 Computer Utilization	1
Elective	3	MGT 399 Mgt. App. of Microcomputers	2
	15	Elective	5
			17

JUNIOR YEAR

ACCT 307 Managerial Accounting	3	FIN 306 Corporation Finance	3
ENGL 304 Business Writing	3	MA SC 413 Management Science I	3
or ENGL 314 Technical Writing	3	MGT 307 Personnel Management	3
MGT 301 Principles of Management	3	MGT 390 Operations Management	3
MKT 301 Principles of Marketing	3	MGT 418 Mgt. Infor. Systems	3
SPCH 364 Organizational Communication	3	Advised Concentration Area[4]	3
Elective	2		18
	17		

SENIOR YEAR

ECON (MGT) 409 Managerial Economics	3	MGT 404 Adv. Stat. Qual. Control	3
MA SC 414 Statistical Analysis	3	MGT 408 Design of Production Systems	3
MGT 305 Economics of Transportation	3	MGT 415 Business Strategy	3
or MGT 317 Logistics Management	3	MGT 423 International Business Mgt.	3
MGT 400 Mgt. of Org. Behavior	3	MGT 490 Selected Topics in Ind. Mgt.	3
MGT 402 Operations Planning and Control	3	Advised Concentration Area[4]	3
Advised Concentration Area[4]	3		18
	18		

137 Total Semester Hours

[1]A two-semester sequence in the same physical or biological science, each including a laboratory.
[2]Anthropology, economics (including crosslisted agricultural economics courses), geography, history, political science, psychology, or sociology (including crosslisted rural sociology courses).
[3]Sophomore literature courses (200-level only) or foreign language literature courses (300-level or higher).
[4]Minimum of 9 semester hours, beyond required courses, in one of the following areas:
Industrial Engineering I E 306, 384, 452, 465, 482, 488.
Textiles Manufacturing TEXT 460, 470, and 471 plus TEXT 176, 201, 202, 308, or 314.
Business Planning FIN 312 and 6 hours to be chosen from FIN 308, 408, MKT 426 or ACCT 410. A student selecting this option must substitute FIN 311 for 306 from the required courses.

Management Support Systems CP SC 130, 210, and either 260, 360 or 240.
Transportation and Logistics MGT 305, 317 or 406, 424, 426.

MANAGEMENT

The Bachelor of Science degree in Management is designed to prepare students for careers as professional managers in corporations, governmental organizations, and small businesses. In addition, the program provides a foundation for graduates who wish to pursue advanced degrees in business and public administration, law, and the social sciences.

The curriculum gives the student a broad exposure to the functional areas of business and allows each to select an area of concentration in a subject that is germane to individual career interests.

The Management curriculum provides (1) an examination of the social, legal, political, and economic environments in which organizations must operate; (2) an understanding of the functional areas of business and their interrelationships; and (3) a knowledge of behavioral science, applied statistics, and mathematics as they relate to organizational problem solving. The program is accredited by the American Assembly of Collegiate Schools of Business.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 211 Principles of Microeconomics	3	CP SC 120 Intro. to Inform. Proc. Sys.	3
ENGL 101 Composition I	3	ECON 212 Principles of Macroeconomics	3
MTHSC 102 Intro. to Math. Analysis	3	ENGL 102 Composition II	3
PSYCH 201 Introduction to Psychology	3	MTHSC 207 Multivariable Calculus	3
or SOC 201 Intro. to Sociology	3	Science Requirement[1]	4
Science Requirement[1]	4		16
	16		

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
MTHSC 301 Stat. Theory and Meth. I	3	LAW 322 Legal Environment of Business	3
Economics Requirement[3]	3	MA SC 310 Intro. to Mgt. Science	3
Literature Requirement[2]	3	MGT 299 Computer Utilization	1
Elective	3	MGT 399 Mgt. Applica. of Microcomputers	2
	15	Elective	4
			16

JUNIOR YEAR

ACCT 307 Managerial Accounting	3	ENGL 304 Business Writing	3
MA SC 312 Dec. Models for Mgt	3	or ENGL 314 Technical Writing	3
MGT 301 Principles of Management	3	FIN 306 Corporation Finance	3
MKT 301 Principles of Marketing	3	MGT 307 Personnel Management	3
PHIL 344 Business Ethics	3	SPCH 364 Organizational Communication	3
Elective	2	Advised Area of Concentration[4]	3
	17	Elective	1
			16

SENIOR YEAR

MGT 390 Operations Management	3	MGT 400 Management of Organizational Behavior	3
MGT 418 Management Info. Sys	3	MGT 415 Business Strategy	3
MGT 423 International Business Management	3	Area Concentration[4]	3
Area Concentration[4]	9	Operations Management Requirement[5]	3
	18	Elective	3
			15

129 Total Semester Hours

[1]A two-semester sequence in the same physical or biological science, each including a laboratory.
[2]Select from sophomore literature courses (200-level only) or foreign language literature courses (300-level or higher).
[3]Select from ECON 301, 302, 308, 309, 314, 412.
[4]Fifteen semester hours beyond required courses, in any 300- or 400-level course in the College of Commerce and Industry, Department of Industrial Engineering, or Department of Computer Science. Specific recommendations are available through the departments of Management, Accounting, Economics, Finance, Marketing, Textiles, Computer Science, and Industrial Engineering. Students should select their area of concentration as soon as possible.
[5]Select from MGT 402, 404, 408.

MARKETING

The degree program for the Bachelor of Science in Marketing is designed to provide students with knowledge of the various aspects of marketing. The Marketing curriculum in combination with general education courses and other business courses prepares students for professional marketing careers in industry, government, or the nonprofit sector. The graduate with this degree also should be well prepared for entrance into Master of Business Administration, Law, or other graduate programs. For students who want a general perspective of marketing, the curriculum provides a broad range of marketing subjects including, but not limited to, sales management, retailing, promotional strategy, marketing research, marketing management, and international marketing. Study areas in technical marketing and services marketing are available to students who seek to specialize. The Marketing curriculum, whether approached from either a general or specialized perspective, provides the conceptual, quantitative, and analytical skills that are necessary for students to function in a dynamic business environment.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 211 Principles of Microeconomics	3	CP SC 120 Intro. to Inf. Proc. Sys	3
ENGL 101 Composition I	3	ECON 212 Principles of Macroeconomics	3
MTHSC 102 Intro. to Math. Analysis[1]	3	ENGL 102 Composition II	3
PSYCH 201 Intro. to Psychology	3	MTHSC 207 Multivariable Calculus[1]	3
or SOC 201 Intro. to Sociology	3	Laboratory Science Requirement[2]	4
Laboratory Science Requirement[2]	4		16
	16		

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
MTHSC 301 Stat. Theory and Meth. I	3	LAW 322 Legal Environ. of Business	3
Economics Requirement[3]	3	MA SC 310 Intro. to Mgt. Science	3
Literature Requirement[4]	3	MGT 299 Computer Utilization I	1
Elective	3	MGT 399 Mgt. Application of Microcomp	2
	15	Elective	4
			16

JUNIOR YEAR

ACCT 307 Managerial Accounting	3	FIN 306 Corporate Finance	3
ENGL 304 Business Writing	3	MKT 302 Consumer Behavior	3
or ENGL 314 Technical Writing	3	MKT 431 Marketing Research	3
MA SC 312 Dec. Mod. for Management	3	SPCH 364 Organizational Communication	3
MGT 301 Principles of Management	3	Study Area Requirement[6]	3
MKT 301 Principles of Marketing	3		15
Elective	3		
	18		

SENIOR YEAR

MGT 390 Operations Management	3	MGT 415 Business Strategy	3
MGT 423 International Bus. Mgt	3	MKT 450 Marketing Management	3
or MKT 427 International Marketing	3	College Requirement[7]	3
PHIL 344 Business Ethics	3	Marketing Study Area Requirement[5]	3
Marketing Study Area Requirement[5]	6	Study Area Requirement[6]	3
Study Area Requirement[6]	3		15
	18		

129 Total Semester Hours

[1]Credit earned in MTHSC 106 and 108 may be substituted for MTHSC 102 and 207 respectively, and 1 or 2 elective hours.

[2]A two-semester sequence including laboratories to be selected from the following: ASTR 101/103 and 102/104, BIOL 103 and 104, CH 101 and 102, CH 105 and 106, GEOL 101/103 and 102/104, or PHYS 207 and 208.

[3]ECON 301, 302, 308, 309, 314, 412.

[4]ENGL 202, 203, 204, 205, 206, 207, 208, 209 or foreign language literature courses (300 level or higher).

[5]Students have the option of choosing from the following study areas:

General Study Area Select from any 400-level marketing course.

Technical Marketing Study Area MKT 420, 426, 438 must be taken.
Services Marketing Study Area MKT 428 and 429 must be taken along with either MKT 420 or 423.
[6]See adviser for list of approved electives for each course of study listed in footnote 5 above.
[7]Students selecting the Technical Marketing study area must take MKT 424 or 430. For all other study areas, any 300- or 400-level course from the College of Commerce and Industry is acceptable with the exception of the required courses.

Notes:
1. Marketing majors are required to earn a grade of C or higher in each marketing course which applies toward graduation.
2. MTHSC 101, 104, and 105 will not be allowed to satisfy requirements for graduation.
3. No more than 60% of coursework may be taken in the College of Commerce and Industry.

TEXTILE CHEMISTRY, TEXTILE MANAGEMENT, AND TEXTILE SCIENCE PROGRAMS

The textile student studies the production of fibers by man and nature, the processes for converting these fibers into a textile structure, the science of the addition of coloring agents and finishes to improve the desirability and serviceability of the product and the test methods for evaluating the performance of textile materials.

Graduates of the School of Textiles, Fiber and Polymer Science hold jobs with responsibilities in corporate management, manufacturing management, design, research, development, technical service, quality control, sales, and personnel management. They create new products and processes and solve problems. They create styles, patterns, textures, and colors for apparel, home, and industrial use as well as special application. They deal with computers, automation, product quality, plant performance, environmental control, and consumer safety.

The textile industry has a continuing need for technically trained men and women to help it meet sociologically desirable standards such as those required by the Occupational Safety and Health Act, the Consumer Product Safety Commission, and the Environmental Protection Agency. In addition, there is a need to reduce costs and increase exports, and to develop new fibers and fabrics for end-use, ranging from apparel and new industrial applications to fiber reinforced composite materials. In the textile curricula a broad background is stressed, with as much as two-thirds of the courses coming from the diverse resources of the University outside the School of Textiles, Fiber and Polymer Science.

The School of Textiles offers three undergraduate degrees which differ in the content of science and business courses. The BS in Textile Chemistry and the BS in Textile Science are both based on the three sciences: chemistry, physics, and mathematics. With this firm base, the graduate is able to apply his/her scientific knowledge to the solution of problems in textile materials involving both chemical and physical principles. The graduate will be concerned with the conception, design, construction, and management of complete systems of labor, machinery and processes for the most efficient production of textiles or related chemicals. These two courses differ in that Textile Chemistry has a greater emphasis on chemistry and Textile Science has greater emphasis on yarn and fabric formation. Both curricula prepare one for graduate study in textiles.

The Bachelor of Science in Textile Management provides the student with a balanced combination of the principles and theories of textile manufacturing and management, as well as concentrated studies in related

Note: No curriculum in the School of Textiles, Fiber and Polymer Science leading to the Bachelor of Science degree will allow credit for ENGL 100 or MTHSC 105 to be used to satisfy requirements for graduation.

options of the student's choice. This program is designed to prepare students for a career in the modern industrial environment and may initially lead to a production management position in the textile industry.

Today's textile graduate must be able to meet the current and anticipated needs of the rapidly changing modern textile industry and also be knowledgeable about the suppliers and users of textile-related materials and equipment. This plan of study maximizes students' leadership potential and professional development in their chosen field.

The School of Textiles, Fiber and Polymer Science also offers advanced degrees as follows: Master of Science in Textile Chemistry, Master of Science in Textile Science, Doctor of Philosophy in Textile and Polymer Science, and in cooperation with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

Textile courses also may be taken as a minor area or as free electives. Recommended groups of courses may consist of 3, 6, 12, or 20 credits.

TEXTILE CHEMISTRY

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
TEXT 175 Intro. to Textile Manufacturing	3	PHYS 122 Phys. with Calculus I	3
History Requirement[1]	3	Elective	3
	17		17

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 225 Organic Chemistry Lab	2	CH 226 Organic Chemistry Lab	2
MTHSC 206 Calculus of Sev. Var	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
PHYS 221 Phys. with Calculus II	3	PHYS 222 Phys. with Calculus III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Literature Requirement[2]	3	Humanities Requirement[3]	3
	16		16

JUNIOR YEAR

CH 331 Physical Chemistry	3	CH 332 Physical Chemistry	3
ECON 200 Economic Concepts	3	ENGL 314 Technical Writing	3
T C 315 Intro. to Polymer Science and Engr	3	T C 316 Chem. Prep. of Text	3
T C 317 Polymer and Fiber Lab	1	TEXT 202 Fabric Structure, Design, and Analysis	4
TEXT 201 Yarn Structure and Form	4	Elective	4
Elective	3		17
	17		

SENIOR YEAR

T C 457 Dyeing and Finishing I	3	T C 458 Dyeing and Finishing II	3
T C 459 Dyeing and Finishing Lab. I	1	T C 460 Dyeing and Finishing Lab. II	1
TEXT 321 Fiber Science	3	TEXT 322 Prop. of Textile Structures	3
Elective	9	Elective	9
	16		16

132 Total Semester Hours

[1]HIST 101, 102, 172, 173.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]See General Education Requirements.

TEXTILE MANAGEMENT

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 General Chemistry	4
or CH 105 Beg. Gen. and Organic Chemistry	4	or CH 106 Beg. Gen. and Organic Chemistry	4
ENGL 101 Composition I	3	CP SC 110 Elem. Comp. Prog	3
MTHSC 102 Intro. to Math. Analysis	3	or CP SC 120 Intro. to Info. Processing Systems	3
TEXT 175 Intro. to Textile Mfg	3	ENGL 102 Composition II	3
History Requirement[1]	3	MTHSC 207 Multivariable Calculus	3
	16	TEXT 176 Natural and Manmade Fibers	4
			17

[1]HIST 101, 102, 172, 173.

CHEMICAL OPTION

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
PSYCH 201 Introduction to Psychology	3	MGT 301 Principles of Management	3
T C 303 Textile Chemistry	3	T C 304 Textile Chemistry	3
T C 305 Textile Chemistry Lab.	1	T C 306 Textile Chemistry Lab	1
TEXT 201 Yarn Structures and Form	4	TEXT 202 Fabric Structure, Design, and Analysis	4
Humanities Requirement[1]	3	Literature Requirement[2]	3
	17		17

JUNIOR YEAR

ECON 211 Principles of Microeconomics	3	ECON 212 Principles of Macroeconomics	3
FIN 306 Corporation Finance	3	ENGL 314 Technical Writing	3
LAW 322 Legal Envir. of Business	3	MGT 307 Personnel Management	3
MKT 301 Principles of Marketing	3	T C 316 Chemical Preparation of Textiles	3
T C 405 Principles of Textile Printing	3	Area Concentration[3]	3
Area Concentration[3]	3		15
	18		

SENIOR YEAR

T C 457 Dyeing and Finishing I	3	MGT 415 Business Strategy	3
T C 459 Dyeing and Finishing Lab. I	1	T C 406 Textile Finishing	3
TEXT 324 Textile Statistics	3	Area Concentration[3]	3
TEXT 470 Textile Costing and Inventory Control	3	Elective	7
Area Concentration[3]	3		16
Elective	3		
	16		

132 Total Semester Hours

[1]See General Education Requirements.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]*Area Concentrations* A minimum of 12 credits must be selected with at least 9 credits from any one of the following:
Personnel ECON 301, 308, LAW 312, 313, 401, MGT 400, 416.
Markets and Marketing ECON 314, 412, MKT 302, 423, 424, 426, 431, 450, TEXT 472.
Industrial Engineering E G 209, I E 364, 488, 489, MGT 402, 408.
Science T C 303/305, 304/306, MTHSC 106, 108, 206, 208, PHYS 122, 221, 222, 223, 224.
Computer Science CP SC 130, 210, 230, 240, 330, 360, 462, MGT 299, 399, TEXT 203, 420.
Textile Specialties TEXT 321, 414, 416, 471, 475, 476.

MANUFACTURING OPTION

SOPHOMORE YEAR

First Semester		Second Semester	
ACCT 201 Principles of Accounting	3	ACCT 202 Principles of Accounting	3
ECON 211 Principles of Microeconomics	3	ECON 212 Principles of Macroeconomics	3
PSYCH 201 Introduction to Psychology	3	MGT 301 Principles of Management	3
TEXT 201 Yarn Structure and Form	4	TEXT 202 Fabric Structures, Design, and Analysis	4
Humanities Requirement[1]	3	Literature Requirement[2]	3
	16		16

JUNIOR YEAR

FIN 306 Corporation Finance	3	ENGL 314 Technical Writing	3
LAW 322 Legal Environ. of Business	3	MGT 307 Personnel Management	3
MKT 301 Principles of Marketing	3	TEXT 314 Chemical Processing of Textiles	4
TEXT 308 Apparel	4	Area Concentration[3]	3
Area Concentration[3]	3	Elective	3
	16		16

SENIOR YEAR

TEXT 324 Textile Statistics	3	MGT 415 Business Strategy	3
TEXT 403 Fiber Processing III	3	TEXT 322 Properties of Textile Structures	3
TEXT 411 Fabric Development III	3	TEXT 426 Instrumentation	3
TEXT 470 Textile Cost and Inventory Control	3	TEXT 429 Textile Research	1
Area Concentration[3]	3	Area Concentration[3]	3
Elective	3	Elective	4
	18		17

132 Total Semester Hours

[1]See General Education Requirements.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]Area Concentrations A minimum of 12 credits must be selected with at least 9 credits from one of the following:
Personnel ECON 301, 308, LAW 312, 313, 401, MGT 400, 416.
Markets and Marketing ECON 314, 412, MKT 302, 423, 424, 426, 431, 450, TEXT 472.
Industrial Engineering E G 209, I E 364, 488, 489, MGT 402, 408.
Science TC 303/305, 304/306, MTHSC 106, 108, 206, 208, PHYS 122, 221, 222, 223, 224.
Computer Science CP SC 130, 210, 230, 240, 330, 462, MGT 299, 399, TEXT 203, 420.
Textile Specialties TEXT 321, 414, 416, 471, 475, 476.

TEXTILE SCIENCE

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
TEXT 175 Intro. to Textile Mfg	3	PHYS 122 Physics with Calculus I	3
History Requirement[1]	3	Elective	3
	17		17

SOPHOMORE YEAR

MTHSC 206 Calculus of Several Var	4	ECON 200 Economic Concepts	3
PHYS 221 Phys. with Calculus II	3	MTHSC 208 Intro. to Ord. Diff. Equa	4
PHYS 223 Physics Lab. II	1	PHYS 222 Phys. with Calculus III	3
TEXT 301 Fiber Processing I	3	PHYS 224 Physics Lab. III	1
Literature Requirement[2]	3	TEXT 302 Fiber Processing II	3
Elective	1	Elective	3
	15		17

JUNIOR YEAR

T C 303 Textile Chemistry	3	ENGL 314 Technical Writing	3
T C 305 Textile Chemistry Lab	1	T C 304 Textile Chemistry	3
TEXT 311 Fabric Development I	3	T C 306 Textile Chemistry Lab	1
TEXT 321 Fiber Science	3	TEXT 312 Fabric Development II	3
Humanities Requirement[3]	3	TEXT 322 Properties of Text. Structures	3
Elective[4]	5	Elective	3
	18		16

SENIOR YEAR

T C 315 Introd. to Polymer Science and Engr	3	TEXT 414 Knitted Structures	3
T C 317 Polymer and Fiber Lab	1	Elective[4]	12
T C 457 Dyeing and Finishing I	3		15
T C 459 Dyeing and Fin. Lab. I	1		
TEXT 403 Fiber Processing III	3		
TEXT 411 Fabric Development III	3		
Elective[4]	3		
	17		

132 Total Semester Hours

[1]HIST 101, 102, 172, 173.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]See General Education Requirements.
[4]See adviser for list of approved electives.

COLLEGE OF EDUCATION

The purpose of the College of Education is to prepare teachers, special services personnel, and school leaders; to provide professional services to education in South Carolina; and to carry out basic and applied research in education. Curricula are organized to give students the opportunities to (1) acquire a broad general education through liberal arts and science courses; (2) develop depth of knowledge in the teaching area; (3) gain an understanding of the historical, philosophical and psychological backgrounds of American education; and (4) acquire knowledge of and skill and experience in using effective teaching techniques.

The College of Education provides undergraduate teacher preparation programs that meet the approved standards for the preparation of educational personnel in South Carolina in Early Childhood Education (K-4), Elementary Education (grades 1-8), Special Education (K-12), and the following Secondary School programs (grades 9-12): agriculture, technology education, biology, chemistry, general science, physics, mathematics, English, French, German, Spanish, history, government, and social studies.

ADMISSION

Admission to teacher education programs in the College of Education is accomplished in three phases: preprofessional, professional, and directed teaching.

Preprofessional Individuals who show an interest in teaching and related areas and who have met the general admission requirements of Clemson University must complete and submit a College of Education application form to be considered for admission to a preprofessional program. These forms are available in all Education departments.

Professional Application to the professional level of a program must be made during the term in which a student is to complete 60 semester hours of work. The professional education admission application, College of Education form (CED 03), is to be submitted to the appropriate office during the term in which the student will have completed 60 hours. Application deadline dates for submission of the CED 03 are as follows: Fall Semester—November 10; Spring Semester—March 1; and Summer Session—June 15. Prerequisites for admission are (1) successful completion of the Basic Skills Education Entrance Examination (EEE)[1], and (2) a minimum cumulative grade-point ratio of 2.5 or a minimum cumulative grade-point ratio of 2.0 and evidence of a SAT score above the 50th percentile of South Carolina examinees in the year the applicant graduated from high school.

Directed Teaching A student shall apply to the field experience director prior to May 1 of the academic year preceding the school year in which directed teaching is to be scheduled. The following conditions must be met prior to registration for directed teaching: (1) admission to the professional level of a program for at least one full semester; (2) completion of at least 95

[1] A student who has not passed the EEE may be conditionally admitted to a teacher education program for a period not to exceed one year. Students will be allowed to take the examination no more than three times. Students who fail to meet the EEE requirement within one year of the date of conditional admission will be dropped from the program and assigned to a nondegree status classification.

semester hours; (3) a minimum cumulative grade-point ratio of 2.0; and (4) a score report on file in the College of Education student records office for the Professional Knowledge Examination of the NTE Core Battery and for the NTE Specialty Area Examination in the student's major.

CONTINUING ENROLLMENT

A student must maintain the grade-point average required by Clemson University for continuing enrollment. Grade-point ratio may be checked at the end of a semester or summer term.

ENROLLMENT IN PROFESSIONAL COURSES

Students enrolled in an approved teacher education program or listed with a major code of 300, 301, or 315 must have a cumulative grade-point ratio of 2.0 or higher for registration in required education (ED), industrial education (IN ED) or agriculture education (AG ED) courses numbered 300 or higher. Any student who desires to enroll in education courses must meet the cumulative grade-point requirements established for education majors. A student who is denied admission may appeal to the College of Education Admissions Committee.

A comprehensive statement of the activities, services, and programs of the College of Education is published in the *Student Handbook,* which is distributed by faculty advisers of education majors and students interested in programs provided by the College of Education.

GRADUATE STUDY

The College of Education offers programs leading to the Master of Education, Master of Human Resource Development, Master of Industrial Education, Specialist in Education, Doctor of Education, and Doctor of Philosophy degrees.

AEROSPACE STUDIES (AFROTC)

Air Force ROTC provides the student an opportunity to earn a commission while pursuing a college degree. It is an educational program that includes courses in history, communication, management, and political science with 10 academic hours credited toward most degrees. The program is designed to meet the need for dedicated and professional leaders in the active duty Air Force. Contact the Department of Aerospace Studies for additional information.

MILITARY SCIENCE (ARMY ROTC)

The requirements for a commission in the U.S. Army are established by the U.S. law and the Department of the Army. The legal and regulatory requirements are available at the Military Science Department. In addition to the Military Science curricula, all candidates for commissioning must successfully complete 3 credits of military history as approved by the professor of military science. All Army scholarship cadets are required to complete one semester of a major Indo-European language or receive placement credit from the University; i.e., German, French, or Spanish, etc. Further information may be obtained from the Military Science Department.

BACHELOR OF ARTS CURRICULA

EARLY CHILDHOOD EDUCATION AND ELEMENTARY EDUCATION PROGRAMS

The Early Childhood Education curriculum prepares the student for teaching positions on the kindergarten and primary levels (grades K-4). The Elementary Education curriculum prepares the student for teaching on the elementary school level (grades 1-8).

EARLY CHILDHOOD EDUCATION

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 105 Essential Computer Skills	1	ENGL 102 Composition II	3
ED 100 Orientation	1	HIST 172 Western Civilization	3
ENGL 101 Composition I	3	MTHSC 116 Contemporary Mathematics for Elementary School Teachers II	3
MTHSC 115 Contemporary Mathematics for the Elementary School Teacher I	3	Foreign Language[4]	4
Foreign Language[4]	4	Science Requirement[2]	4
Science Requirement[2]	4		17
	16		

SOPHOMORE YEAR

HIST 173 Western Civilization	3	ED 301 Principles of American Education	3
MTHSC 216 Geometry for Elementary School Teachers	3	ED 334 Child Growth and Development	3
Foreign Language[4]	3	MUSIC 210 or 311 Music Appreciation	3
Literature Requirement[1]	3	Foreign Language[4]	3
Science Requirement[2]	4	Literature Requirement[1]	3
Social Science Requirement[3]	3	Social Science Requirement[3]	3
	19		18

JUNIOR YEAR

A A H 210 Introduction to Art and Architecture	3	ED 400 Early Childhood Field Experience[5]	1
ED 302 Educational Psychology	3	ED 461 Teaching Reading in the Elementary School	3
ED 321 Physical Eduction for Elementary School	3	ED 483 Methods and Materials for Early Childhood Education	3
ED 336 Behavior of the Preschool Child[6]	3	ED 488 Teaching the Language Arts in the Elementary School	3
ED 466 Introduction to Early Childhood Education	3	ED (IN ED) 315 Integrating Computers into the Classroom	1
Elective	4	IN ED 372 Arts and Crafts for the Elementary Child	3
	19	SPCH 250 Public Speaking	3
			17

SENIOR YEAR

(Directed Teaching—Either Semester)

ED 458 Health Education	3	ED 462 Diagnostic and Corrective Reading	3
ED 471 The Exceptional Child	3	ED 484 Directed Teaching in Early Childhood Education[6]	12
ENGL 385 Children's Literature	3		15
MUSIC 400 Music in the Elementary School Classroom	3		
Elective	6		
	18		

139 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]A total of 12 semester hours composed of both biological and physical sciences, including appropriate laboratories, is required. Eight of these hours must be in a two-semester sequence.
[3]Anthropology, economics (including AP EC 202), geography, political science, psychology, sociology.
[4]Two years of the same foreign language are required.
[5]Must be taken in the same semester as ED 461. (Students taking ED 461 during the summer must register for ED 400 during the following fall semester.)
[6]To be taken prior to or in the same semester as ED 466.

ELEMENTARY EDUCATION

FRESHMAN YEAR

First Semester

CP SC 105 Essential Computer Skills 1
ED 100 Orientation 1
ENGL 101 Compostition I 3
MTHSC 115 Contemporary Mathematics for Elementary School Teachers I 3
Foreign Language[4] 4
Science Requirement[1] 4
16

Second Semester

ENGL 102 Composition II 3
HIST 172 Western Civilization 3
MTHSC 116 Contemporary Mathematics for Elementary School Teachers II 3
Foreign Language[4] 4
Science Requirement[1] 4
17

SOPHOMORE YEAR

HIST 173 Western Civilization 3
MTHSC 216 Geometry for Elementary School Teachers 3
Foreign Language[4] 3
Literature Requirement[2] 3
Science Requirement[1] 4
Social Science Requirement[3] 3
19

ED 301 Principles of American Education 3
ED 334 Child Growth and Development 3
SPCH 250 Public Speaking 3
Foreign Language[4] 3
Literature Requirement[2] 3
Social Science Requirement[3] 3
18

JUNIOR YEAR

ED 302 Educational Psychology 3
ED 321 Physical Education for Elementary School 3
ED 451 Elementary Methods in Science Teaching 3
ED 488 Teaching the Language Arts in the Elementary School 3
ENGL 385 Children's Literature 3
IN ED 372 Arts and Crafts 3
18

ED (IN ED) 315 Integrating Computers into the Classroom 1
ED 401 Elementary Field Experience[5] 1
ED 452 Elem. Methods in Mathematics Teaching 3
ED 461 Teaching Reading in the Elementary School 3
ED 487 Teaching Social Studies in the Elementary School 2
MUSIC 400 Music in the Elementary School Class 3
Elective 4
17

SENIOR YEAR

(Directed Teaching—Either Semester)

A A H 210 Introduction to Art and Architecture 3
ED 458 Health Education 3
ED 471 The Exceptional Child 3
MUSIC 210 or 311 Music Appreciation 3
Elective 6
18

ED 462 Diagnostic and Corrective Reading 3
ED 481 Directed Teaching 12
15

138 Total Semester Hours

[1]A total of 12 credits composed of both biological and physical sciences, including appropriate laboratories, is required. Eight of these credits must be in a two-semester sequence.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]Anthropology, economics (including AP EC 202), geography, political science, psychology, and sociology.
[4]Two years of the same foreign language are required.
[5]Must be taken in the same semester as ED 461. (Students taking ED 461 during the summer must register for ED 401 during the following fall semester.)

SECONDARY EDUCATION CURRICULA

Programs leading to a Bachelor of Arts degree in Secondary Education are available to students preparing to teach English, history, mathematical sciences, French, German, Spanish, natural sciences, political science, and social science, on the secondary school level (grades 9-12). The teaching field should be selected as early as possible in order that appropriate freshman and sophomore courses may be taken.

Each curriculum requires a major concentration in the teaching field. Specific courses and sequences have been designated by teacher education committees to meet requirements for those planning to teach. Students who have elective courses in the teaching area should consult the departmental adviser prior to scheduling these courses.

The professional education courses should be completed in sequence prior

to registering for the block schedule. Application to Directed Teaching (ED 412) should be made in writing no later than May 1 preceding the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for Directed Teaching.

Education 412 is conducted on a full-day basis, "block schedule," for one semester.

TEACHING AREA: ENGLISH

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 105 Essential Computer Skills	1	ENGL 102 Composition II	3
ED 100 Orientation	1	HIST 172 Western Civilization	3
ENGL 101 Composition I	3	MTHSC 102 Introduction to Mathematical Analysis	3
MTHSC 101 Finite Probability	3	Foreign Language[1]	4
Foreign Language Requirement[1]	4	Science Requirement[2]	4
Science Requirement[2]	4	Elective	1
Elective	1		18
	17		

SOPHOMORE YEAR

ED 301 Principles of American Education	3	ED 302 Educational Psychology	3
ENGL 202 Major Forms of Literature	3	ENGL 209 Contemporary Literature	3
HIST 173 Western Civilization	3	ENGL 353 Ethnic American Literature	3
SPCH 250 Public Speaking	3	Foreign Language[1]	3
Foreign Language[1]	3	Social Science Requirement[3]	3
Science Requirement[2]	4	Elective	3
	19		18

JUNIOR YEAR

ED 335 Adolescent Growth and Development	3	ED 424 Methods and Materials in Secondary English[5]	3
ED (IN ED) 315 Integrating Computers into the Classroom	1	ED 498 Secondary Content Area Reading[5]	3
HIST 361 or 363 History of England	3	Social Science Requirement[3]	3
Teaching Major[4]	9	Teaching Major[4]	6
Elective	2	Elective	3
	18		18

SENIOR YEAR

(Directed Teaching—Either Semester)

ED 458 Health Education	3	ED 412 Directed Teaching	12
ED 471 The Exceptional Child	3		12
HUM 301 or 302 Humanities[6]	3		
Teaching Major[4]	9		
	18		

138 Total Semester Hours

[1]Two years of the same language are required.
[2]A total of 12 credits composed of both physical and biological sciences, including appropriate laboratories, is required. Eight of the credits must be in a two-semester sequence.
[3]Anthropology, economics, (including AP EC 202), geography, political science, psychology, sociology.
[4]In addition to ENGL 209, 312 and 353, the Teaching Major requires 24 credits of junior and senior English courses and must include ENGL 386, 400, 401, 405 or 406, 411, 422, 423, 424 or 425, 435 and 485.
[5]To be taken the semester prior to Directed Teaching.
[6]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.

TEACHING AREA: HISTORY AND GEOGRAPHY

FRESHMAN YEAR

First Semester		Second Semester	
ED 100 Orientation	1	CP SC 105 Essential Computer Skills	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 101 Finite Probability	3	HIST 172 Western Civilization	3
Foreign Language[1]	4	MTHSC 102 Introduction to Math. Analysis	3
Science Requirement[2]	4	Foreign Language[1]	4
Elective	3	Science Requirement[2]	4
	18		18

SOPHOMORE YEAR

HIST 173 Western Civilization	3
SOC 201 Introduction to Sociology	3
Foreign Language[1]	3
Literature Requirement[3]	3
Science Requirement[2]	4
Elective	2
	18

ED 301 Principles of American Education	3
HIST 101 History of the U.S.	3
PO SC 101 Introduction to American Politics	3
Foreign Language[1]	3
Geography Requirement[4]	3
Elective	3
	18

JUNIOR YEAR

ED 302 Educational Psychology	3
ED 335 Adolescent Growth and Development	3
HIST 102 History of the U.S.	3
Teaching Major[5]	9
	18

ED (IN ED) 315 Integrating Computers into the Classroom	1
ED 428 Methods and Materials Secondary Social Studies[7]	3
ED 498 Secondary Content Area Reading[7]	3
SPCH 250 Public Speaking	3
Teaching Major[5]	6
Elective	2
	18

SENIOR YEAR

(Directed Teaching—Either Semester)

ECON 200 Economics Concepts	3
ED 458 Health Education	3
HUM 301 or 302 Humanities[6]	3
Teaching Major[5]	9
	18

ED 412 Directed Teaching	12
ED 471 The Exceptional Child	3
	15

141 Total Semester Hours

[1]Two years of the same language are required.
[2]A total of 12 credits composed of both physical and biological sciences, including appropriate laboratories, is required. Eight of the credits must be in a two-semester sequence.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]GEOG 101, 102, 103.
[5]The Teaching Major consists of 24 credits of junior and senior (300 and 400) level courses composed of 18 credits from history and 6 credits from geography. Courses must be selected with the consent of the major adviser and include at least 3 credits in each of the following categories: U.S. history or geography, European history or geography, Third World or non-European history or geography. At least 6 credits must be at the 400 level. HIST 313 is recommended for those planning to teach in South Carolina.
[6]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.
[7]To be taken in the semester preceding Directed Teaching.

TEACHING AREA: MATHEMATICS

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
CP SC 105 Essential Computer Skills	1	ENGL 102 Composition II	3
ED 100 Orientation	1	MTHSC 108 Calulus of One Variable II	4
ENGL 101 Composition I	3	Foreign Language[1]	4
MTHSC 106 Calculus of One Variable I	4	Elective	3
Foreign Language[1]	4		18
	17		

SOPHOMORE YEAR

ED 302 Educational Psychology	3
MTHSC 206 Calculus of Several Variables	4
Foreign Language[1]	3
Literature Requirement[2]	3
Science Requirement[3]	3
Elective	1
	17

CP SC 110 Elementary Computer Programming	3
ED 335 Adolescent Growth and Development	3
HIST 172 Western Civilization	3
Foreign Language[1]	3
Science Requirement[3]	3
Social Science Requirement[4]	3
	18

JUNIOR YEAR

ED 301 Principles of American Education	3
ED (IN ED) 315 Integrating Computers into the Classroom	1
HIST 173 Western Civilization	3
MTHSC 301 Statistical Theory and Methods I	3
MTHSC 308 College Geometry	3
Social Science Requirement[4]	3
Elective	3
	19

ED 426 Methods and Materials in Secondary Mathematics[7]	3
ED 498 Secondary Content Area Reading[7]	3
HUM 301 or 302 Humanities[5]	3
MTHSC 311 Linear Algebra	3
MTHSC 408 Topics in Geometry	3
Elective	3
	18

SENIOR YEAR

(Directed Teaching—Either Semester)

ED 458 Health Education	3	ED 412 Directed Teaching	12
ED 471 The Exceptional Child	3		12
MTHSC 412 Introduction to Modern Algebra	3		
MTHSC 453 Advanced Calculus I	3		
SPCH 250 Public Speaking	3		
Mathematics Requirement[6]	3		
	18		

137 Total Semester Hours

[1]Two years of the same language are required.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]Astronomy, chemistry, geology, physics.
[4]Economics (including AP EC 202), geography, political science, psychology, sociology.
[5]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.
[6]Any 200-400 level mathematics course, except MTHSC 207, 210, 215, 216.
[7]To be taken the semester prior to Directed Teaching.

TEACHING AREA: MODERN LANGUAGES (French, German, and Spanish)

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 105 Essential Computer Skills	1	ENGL 102 English Composition II	3
ED 100 Orientation	1	HIST 172 Western Civilization	3
ENGL 101 English Composition I	3	MTHSC 102 Introduction to Math. Analysis	3
MTHSC 101 Finite Probability	3	Foreign Language[1]	4
Foreign Language[1]	4	Science Requirement[2]	4
Science Requirement[2]	4		17
	16		

SOPHOMORE YEAR

ED 301 Prin. of American Education	3	ED 302 Educational Psychology	3
HIST 173 Western Civilization	3	Foreign Language[1]	3
Foreign Language[1]	3	Literature Requirement[3]	3
Literature Requirement[3]	3	Social Science Requirement[4]	3
Science Requirement[2]	4	Elective	6
	16		18

JUNIOR YEAR

ED 335 Adolescent Growth and Development	3	ED (IN ED) 315 Integrating Computers into the Classroom	1
Teaching Major[6]	9	ED 471 The Exceptional Child	3
Social Science Requirement[4]	3	SPCH 250 Public Speaking	3
Elective	3	Teaching Major[6]	9
	18		16

SENIOR YEAR

(Directed Teaching—Either Semester)

ED 425 Methods and Materials in Secondary Modern Language[5]	3	ED 412 Directed Teaching	12
ED 458 Health Education	3	Elective	3
ED 498 Secondary Content Area Reading[5]	3		15
HUM 301 or 302 Humanities[7]	3		
Teaching Major[6]	6		
	18		

134 Total Semester Hours

[1]Two years of the same language are required.
[2]A total of 12 credits, composed of both physical and biological sciences, including appropriate laboratories, is required. Eight of the credits must be in a two-semester sequence.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]Economics (including AP EC 202), political science, psychology, sociology, geography, anthropology.
[5]To be taken the semester prior to Directed Teaching.
[6]The Teaching Major requires 24 credits in French, German, or Spanish as listed.
French Major Must include FR 409, and 21 credits arranged as follows:
Group I 12 credits from FR 301 or 302, 305, 307, 309.
Group II 9 credits at the 400 level, including at least one 400-level literature course.
German Major Must include GER 305, 411, and 18 credits arranged as follows:
Group I 12 credits from GER 301, 302, 308, 316, 412 or 416.
Group II 6 credits from GER 401, 402, 403, 413.
Spanish Major must include 24 credits arranged as follows:
Group I 6 credits from SPAN 303 or 304 and 311 (preferably in sequence).

Group II 9 credits from SPAN 305, 307, 308.
Group III 6 credits from SPAN 401 or 402 and 409.
Group IV 3 credits to be selected from 300-400 level courses.

[7]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.

TEACHING AREA: POLITICAL SCIENCE AND ECONOMICS

FRESHMAN YEAR

First Semester		Second Semester	
ED 100 Orientation	1	CP SC 105 Essential Computer Skills	1
ENGL 101 English Composition I	3	ENGL 102 English Composition II	3
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 101 Finite Probability	3	MTHSC 102 Introduction to Mathematical Analysis	3
Foreign Language[1]	4	Foreign Language[1]	4
Science Requirement[2]	4	Science Requirement[2]	4
	18		18

SOPHOMORE YEAR

HIST 101 History of the U.S.	3	ECON 200 Economic Concepts[8]	3
SOC 201 Introduction to Sociology	3	ED 301 Principles of American Education	3
Foreign Language[1]	3	HIST 102 History of the U.S.	3
Literature Requirement[3]	3	PO SC 101 Introduction to American Politics	3
Science Requirement[2]	4	Foreign Language[1]	3
Elective	2	Elective	3
	18		18

JUNIOR YEAR

ED 302 Educational Psychology	3	ED 428 Methods and Materials in Secondary Social Studies[5]	3
ED (IN ED) 315 Integrating Computers into the Classroom	1	ED 498 Secondary Content Area Reading[5]	3
ED 335 Adolescent Growth and Development	3	SPCH 250 Public Speaking	3
Teaching Major[4]	9	Teaching Major[4]	9
Elective	2		18
	18		

SENIOR YEAR

(Directed Teaching—Either Semester)

ED 458 Health Education	3	ED 412 Directed Teaching	12
HUM 301 or 302 Humanities[7]	3	ED 471 The Exceptional Child	3
Geography Requirement[6]	3		15
Teaching Major[4]	6		
Elective	3		
	18		

141 Total Semester Hours

[1]Two years of the same language are required.

[2]A total of 12 semester credits, composed of both physical and biological science including appropriate laboratories, is required. Eight of the credits must be in a two-semester sequence.

[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.

[4]The Teaching Major requires 24 credits of junior and senior level (300-400) courses selected from political science and economics (ECON 301, 302, 309, 310, 404 recommended) with no fewer than 9 credits in each of these areas. Political science credits are to be drawn from at least 3 of the following fields:
American Governments—PO SC 403, 405, 432, 433, 442
Comparative Politics—PO SC 371, 373, 471, 475, 476, 477
International Relations—PO SC 361, 428, 462, 463, 465
Political Theory—PO SC 351, 352, 453
Public Policy and Administration—PO SC 302, 321, 422

[5]To be taken the semester prior to Directed Teaching.

[6]To be selected from GEOG 101, 102 or 103.

[7]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.

[8]ECON 211 and 212 may be taken in lieu of ECON 200. In which case, the additional 3 credits will be recorded as electives.

Note: This program enables the student to meet the requirements for certification in South Carolina in the field of government. If certification in social studies is desired, the student must take a three-hour course in either geography or sociology.

TEACHING AREA: PSYCHOLOGY AND SOCIOLOGY

FRESHMAN YEAR

First Semester		Second Semester	
ED 100 Orientation	1	CP SC 105 Essential Computer Skills	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 101 Finite Probability	3	MTHSC 102 Introduction to Mathematical Analysis	3
Foreign Language[1]	4	Foreign Language[1]	4
Science Requirement[2]	4	Science Requirement[2]	4
	18		18

SOPHOMORE YEAR

HIST 101 History of the U.S.	3	HIST 102 History of the U.S.	3
PSYCH 201 Introduction to Psychology	3	PO SC 101 Introduction to American Politics	3
Foreign Language[1]	3	SOC 201 Introduction to Sociology	3
Literature Requirement[3]	3	SPCH 250 Public Speaking	3
Science Requirement[2]	4	Foreign Language[1]	3
Elective	2	Geography Requirement[5]	3
	18		18

JUNIOR YEAR

ED 302 Educational Psychology	3	ECON 200 Economic Concepts	3
ED (IN ED) 315 Integrating Computers into the Classroom	1	ED 301 Principles of American Education	3
ED 335 Adolescent Growth and Development	3	ED 428 Methods and Materials in Secondary Social Studies[6]	3
Teaching Major[4]	9	ED 498 Secondary Content Area Reading[6]	3
Elective	2	Teaching Major[4]	6
	18		18

SENIOR YEAR

(Directed Teaching—Either Semester)

ED 458 Health Education	3	ED 412 Directed Teaching	12
HUM 301 or 302 Humanities[7]	3	ED 471 The Exceptional Child	3
Teaching Major[4]	6		15
Elective	6		
	18		

141 Total Semester Hours

[1]Two years of the same language are required.
[2]A total of 12 credits composed of both physical and biological sciences, including appropriate laboratories, is required. Eight of the credits must be in a two-semester sequence.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]The Teaching Major consists of 21 credits of junior and senior (300 and 400) level courses selected from sociology/anthropology and psychology with no fewer than 9 credits in each of these two areas. Recommended courses include PSYCH 320, 330, 333, 340, 352, 370, 415; SOC 311, 392, 395, 460, 461, 481, ANTH 301, 320.
[5]GEOG 101, 102, 103.
[6]To be taken the semester prior to Directed Teaching.
[7]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.

SPECIAL EDUCATION

The Bachelor of Arts degree in Special Education is designed to prepare students for professional careers working with mildly to moderately handicapped school-aged students (grades K-12). The core curriculum assures the graduate of having the skills and knowledge required for initial employment in the public schools of this state. By using the electives advisedly, students should be able to meet requirements of any state which provides a resource room model providing special services to any mildly to moderately handicapped students, provided the students share similar learning styles. Practical experiences begin with the freshman year and peak with the senior year. These experiences provide opportunities to enable students to apply their knowledge and skills. The practical experiences culminate in the directed teaching experience under the supervision of a fully certified teacher and the professional faculty of the College of Education.

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 105 Essential Computer Skills	1	ENGL 102 English Composition II	3
ED 100 Orientation	1	HIST 172 Western Civilization	3
ENGL 101 English Composition I	3	MTHSC 116 Contemporary Mathematics for Elementary School Teachers II	3
MTHSC 115 Contemporary Mathematics for Elementary School Teachers I	3	Foreign Language[3]	4
Foreign Language[3]	4	Science Requirement[1]	4
Science Requirement[1]	4	Elective	1
	16		18

SOPHOMORE YEAR

HIST 173 Western Civilization	3	A A H 210 Introduction to Art and Architecture	3
MUSIC 210 or 311 Music Appreciation	3	GEOG 101 Introduction to Geography	3
Foreign Language[3]	3	SOC 201 Introduction to Sociology	3
Literature Requirement[2]	3	or SOC 202 Social Problems	3
Science Requirement[1]	4	SPCH 250 Public Speaking	3
Elective	3	Foreign Language[3]	3
	19	Elective	3
			18

JUNIOR YEAR

ED 301 Principles of American Education	3	ED (IN ED) 315 Integrating Computers into the Classroom	1
ED 302 Educational Psychology	3	ED 335 Adolescent Growth and Development	3
ED 334 Child Growth and Development	3	ED 371 Characteristics of the Mildly Handicapped	3
ED 458 Health Education	3	ED 461 Teaching Read. in the Elem. School	3
ED 471 The Exceptional Child	3	or ED 498 Secondary Content Area Read	3
Elective	3	ED 452 Elementary Methods in Mathematics Teaching	3
	18	ED 488 Teaching Language Arts in the Elementary School	3
			16

SENIOR YEAR

(Directed Teaching Must Be Taken as Shown)

ED 491 Assessment of the Mildly Handicapped	3	ED 413 Directed Teaching	12
ED 492 Academic Skill Intervention for the Handicapped	3	ED 495 Role and Function of the Resource Teacher	3
ED 493 Behavioral Skill Interven. for the Handicapped	3		15
ED 494 Teaching Reading to the Exceptional Child	3		
ED 496 Special Education Field Experience	3		
	15		

135 Total Semester Hours

[1]A total of 12 semester hours composed of both biological and physical sciences, including appropriate laboratories, is required. Eight of these hours must be a two-semester sequence.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]Two years of the same foreign language are required.

BACHELOR OF SCIENCE CURRICULA

AGRICULTURAL EDUCATION

The College of Education and the College of Agricultural Sciences conduct a cooperative program to produce agricultural teachers (grades 9-12) for South Carolina. (See the Agricultural Education curriculum under the College of Agricultural Sciences.)

GRAPHIC COMMUNICATIONS

The Bachelor of Science degree in Graphic Communications is designed to prepare students for professional careers in printing, publishing, packaging, and related industries. The core curriculum assures the graduate of having the skills and knowledge required by most entry-level jobs. The approved electives provide each student the opportunity to select courses which enhance career preparation in specific segments of graphic communications.

The nature of the coursework is heavily oriented around individual laboratory performance which stresses the development of problem solving skills in a broad cross section of manufacturing areas. Applications include all major processes and a variety of industry segments, including commercial printing, publishing, package production, specialty printing, and industrial applications of printing technology beyond communications. The most common career opportunities are in printing management, production planning and supervision, and both commercial and technical sales.

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	CP SC 110 Elementary Computer Programming	3
G C 101 Orientation to Graphic Communication	1	or CP SC 120 Introduction to Information Processing Systems	3
IN ED 106 Drafting for Industrial Education I	3	ECON 200 Economic Concepts	3
PSYCH 201 Introduction to Psychology	3	or ECON 211 Principles of Microeconomics	3
Approved Laboratory Science Requirement[2]	4	ENGL 102 English Composition II	3
Mathematics Requirement[1]	3	EX ST 301 Introductory Statistics	3
	17	or MTHSC 301 Stat. Theory and Meth. I	3
		G C 104 Graphic Communications I	3
		SPCH 250 Public Speaking	3
			18

SOPHOMORE YEAR

ACCT 203 Financial Accounting[5]	3	ACCT 307 Managerial Accounting	3
G C 207 Graphic Communications II	3	G C 310 Alternative Approaches to Imaging	3
G C 304 Photographic Techniques	3	IN ED 240 Machining Practice	3
MGT 299 Computer Utilization I	1	MGT 399 Management Application of Microcomputers	2
MGT 301 Principles of Management	3	Laboratory Science Requirement[2]	4
Approved Laboratory Science Requirement[2]	4	Major Requirement[1]	2
	17		17

G C 350 Internship I[4] 1

JUNIOR YEAR

G C 406 Problems in Spec. Printing	4	ENGL 314 Technical Writing	3
IN ED 208 Electricity	3	G C 440 Advanced Lithographic Methods	4
MGT 307 Personnel Management	3	MKT 301 Principles of Marketing	3
or PSYCH 364 Industrial Psychology	3	PHIL 344 Business Ethics	3
Environmental Science Requirement[6]	3	Major Requirement[1]	3
Literature Requirement[3]	3		16
	16		

G C 450 Internship II[4] 1

SENIOR YEAR

G C 444 Current Developments and Trends in Graphic Communications	4	G C 448 Planning and Controlling Printing Functions	3
IN ED 325 Industrial Organ. and People	3	G C 480 Senior Seminar	2
Major Requirement[1]	6	Major Requirement[1]	4
Elective	3	Elective	7
	16		16

135 Total Semester Hours

[1]Major Requirement and Mathematics Requirement must be approved by adviser prior to registration.
[2]Approved Laboratory Science Requirement must include a two-semester sequence from chemistry or physics.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]Student is required to complete at least two work periods. At least one must be in a fall or spring semester. (Summer at least 12 weeks; fall/spring 15 week minimum.)
[5]ACCT 201 and 202 may be taken in lieu of ACCT 203.
[6]EN SC 200, 400, 432, 472.

INDUSTRIAL EDUCATION

The Bachelor of Science degree in Industrial Education is designed to prepare students for professional teaching positions, as well as occupations within the framework of human resource development/industrial training in the

private sector. To accomplish these purposes the curriculum is divided into the three areas of specialization. By the end of the freshman year, each student is required to select one of the three options: Human Resource Development, Industrial Technology Education, or Vocational-Technical Education. Each option requires 135 semester hours of coursework.

HUMAN RESOURCE DEVELOPMENT OPTION

The Human Resource Development option is designed to prepare students to enter industry or business as training and development specialists. The curriculum provides participants with a broad exposure to industrial processes in the areas of manufacturing, construction, power/transportation, and communications. Numerous hands-on experiences related to the application of technology in industry are integrated with valuable skills and knowledge from the training and development profession. Students will exit the program with skills related to analyzing needs; conducting job and task analyses; designing, marketing, and evaluating training programs; delivering professional presentations; and developing instructional materials.

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	ENGL 102 Composition II	3
IN ED 101 Introduction to Industrial Education	3	EX ST 301 Introductory Statistics	3
IN ED 106 Drafting for Industrial Education I	3	IN ED 107 Drafting for Industrial Education II	3
Mathematics Requirement	3	IN ED 108 Training Programs in Industry I	3
Science Requirement[1]	4	Science Requirement[1]	4
	16		16

SOPHOMORE YEAR

ACCT 200 Basic Accounting	3	ECON 200 Economic Concepts	3
or ACCT 201 Principles of Accounting	3	or ECON 211 Principles of Microeconomics	3
CP SC 120 Introduction to Information Proc. Systems	3	IN ED 204 Communications Technology I	3
IN ED 202 Manufacturing Technology I	3	IN ED 205 Power Technology I	3
IN ED 210 Construction Technology I	3	PSYCH 201 Introduction to Psychology	3
Literature Requirement[2]	3	SPCH 250 Public Speaking	3
	15	Elective	1
			16

JUNIOR YEAR

ECON 301 Economics of Labor	3	ENGL 314 Technical Writing	3
or ECON 308 Collective Bargaining	3	IN ED 325 Industrial Organizations and People	3
IN ED 412 Communications Technology II	3	IN ED 415 Construction Technology II	3
MGT 301 Principles of Management	3	MGT 307 Personnel Management	3
Humanities Requirement[3]	3	Major Requirement[4]	3
Major Requirement[4]	3	Elective	3
Elective	3		18
	18		

SENIOR YEAR

IN ED 404 Org. of Ind. Training Mat	3	IN ED 408 Training Programs in Industry II	3
IN ED 468 Power Technology II	3	IN ED 418 Manufacturing Technology II	3
IN ED 496 Public Relations	3	IN ED 465 Instructional Video Production	3
Communication Requirement[5]	3	MGT 416 Management of Human Resources	3
Major Requirement[4]	3	Major Requirement[4]	3
Elective	3	Psychology Requirement[6]	3
	18		18

135 Total Semester Hours

[1]An 8-credit sequence of biological or physical science, each including laboratories.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]PHIL 344, SPCH 340, 360, 361.
[4]Major Requirement to be approved by adviser; two technical courses must be represented.
[5]Select from ENGL 304, SPCH 340, 350, 360, 361, 364. Students may not use the same course to satisfy both the Communication and Humanities Requirements.
[6]PSYCH 364, 368, 397.
Note: One summer (400 clockhours) of field experience is required of each student following the sophomore year.

INDUSTRIAL TECHNOLOGY EDUCATION OPTION

The Industrial Technology Education option is for students who desire to teach industrial technology in the secondary schools (grades 9-12). Industrial technology is the subject area in the public school system which attempts to provide youth with an interpretation of American industry. It is a general education subject designed to give students exploratory experience in the classroom and laboratory. Majors in this option are qualified to seek certification as secondary school teachers of industrial technology, prevocational, and industrial arts education.

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 105 Essential Computer Skills	1	ENGL 102 Composition II	3
ED 100 Orientation	1	IN ED 106 Drafting for Industrial Education I	3
ENGL 101 Composition I	3	Mathematics Requirement	3
IN ED 101 Introduction to Industrial Education	3	Science Requirement[1]	4
Mathematics Requirement	3	Elective	4
Science Requirement[1]	4		17
Elective	2		
	17		

SOPHOMORE YEAR

HIST 173 Western Civilization	3	IN ED 107 Drafting for Industrial Education II	3
IN ED 202 Manufacturing Technology I	3	IN ED 204 Communications Technology I	3
IN ED 210 Construction Techniques I	3	IN ED 205 Power Technology I	3
Literature Requirement[2]	3	MUSIC 210 Music Appreciation	3
Science Requirement[1]	4	SPCH 250 Public Speaking	3
Elective	1	Social Science Requirement[3]	3
	17		18

JUNIOR YEAR

ED 302 Educational Psychology	3	A A H 210 Introduction to Art and Architecture	3
ED 458 Health Education	3	ED 335 Adolescent Growth and Development	3
IN ED 412 Communication Technology II	3	IN ED 317 Management of Industrial Education Labs.	3
IN ED 468 Power Technology II	3	IN ED 415 Construction Technology II	3
Social Science Requirement[3]	3	IN ED 418 Manufacturing Technology II	3
Elective	1	Major Requirement[4]	3
	16		18

SENIOR YEAR

COLED (IN ED) 480 Ed. App. of Microcomputers	3	IN ED 402 Directed Teaching	12
IN ED 405 Course Org. and Eval	3	IN ED 422 Hist. and Phil. of Ind. and Voc. Ed	3
IN ED 425 Teaching Industrial Subjects	3		15
IN ED 443 Vocational Special Needs Education	3		
or ED 471 The Exceptional Child	3		
Major Requirement[4]	3		
Elective	2		
	17		

135 Total Semester Hours

[1]Both biological and physical laboratory sciences must be represented with an 8-credit sequence in one.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]Economics (including AP EC 202), geography, history, psychology, sociology. At least two fields must be represented with six but not more than six in one field.
[4]G C 207, 304, IN ED 203, 206, 208, 215, 240, 316, 320, 407, 414, 432, 435, 438, 452, 464, 465, 470, 482, TEXT 333, 460.

VOCATIONAL-TECHNICAL EDUCATION OPTION

The Vocational-Technical Education option is designed to prepare teachers of vocational and technical subjects in the senior high schools, area vocational centers, and technical education centers. All elective courses in this option will be in an area of specialization or related fields. Teachers graduating from this option will possess the skills and knowledge required to teach the occupation or family of occupations in their area of specialization.

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	ENGL 102 Composition II	3
Mathematics Requirement	3	Mathematics Requirement	3
Science Requirement[1]	4	Science Requirement[1]	4
Technical Specialty Requirement[2]	3	Technical Specialty Requirement[2]	3
Elective	3	Elective	3
	16		16

SOPHOMORE YEAR

Literature Requirement[3]	3	Humanities Requirement[1]	3
Social Science Requirement[1]	3	Science Requirement[1]	3
Technical Specialty Requirement[2]	6	Social Science Requirement[1]	3
Elective	4	Technical Specialty Requirement[2]	6
	16		15

SUMMER

IN ED 350 Industrial Cooperative Experience I 6

JUNIOR YEAR

IN ED 312 Motivation and Discipline in Vocational Education	3	IN ED 317 Mgt. of Ind. Ed. Laboratories	3
SPCH 250 Public Speaking	3	Technical Specialty Requirement[2]	6
Technical Specialty Requirement[2]	6	Major Requirement[4]	3
Major Requirement[4]	3	Elective	3
	15		15

SUMMER

IN ED 450 Industrial Cooperative Experience II 6

SENIOR YEAR

IN ED 405 Course Organization and Evaluation	3	IN ED 422 History and Philosophy of Industrial and Vocational Education	3
IN ED 420 Instructional Technology	3	IN ED 434 Internship in Voc. Tech. Ed. II	6
IN ED 425 Teaching Industrial Subjects	3	IN ED 442 Competency Testing in Voc. Subj	3
IN ED 433 Internship in Voc. Tech. Ed. I	6	IN ED 480 Ed. Appl. of Microcomputers	3
	15		15

135 Total Semester Hours

[1]See General Education Requirements.
[2]Technical specialties must relate to one of the Trades and Industries programs recognized by the South Carolina Department of Education. See adviser for list of approved specialties and list of courses available to meet the Technical Specialty Requirement.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]Major Requirement must be approved by adviser.

MATHEMATICS TEACHING

The program leading to a Bachelor of Science degree in Mathematics Teaching is designed for students planning to teach mathematics on the secondary school level (grades 9-12).

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
CH 105 Beginning General and Organic Chemistry	4	CH 106 Beginning General and Organic Chemistry	4
CP SC 105 Essential Computer Skills	1	or CH 112 General Chemistry	4
ED 100 Orientation	1	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	Elective	3
	17		18

SOPHOMORE YEAR

ED 302 Educational Psychology	3	CP SC 110 Elementary Computer Programming	3
HIST 172 Western Civilization	3	ED 335 Adolescent Growth and Development	3
MTHSC 206 Calculus of Several Variables	4	HIST 173 Western Civilization	3
PHYS 207 General Physics I	4	HUM 301 or 302 Humanities[4]	3
Literature Requirement[1]	3	PHYS 208 General Physics II	4
	17	Elective	2
			18

JUNIOR YEAR

ED 301 Principles of American Education	3
MTHSC 301 Statistical Theory and Methods I	3
MTHSC 308 College Geometry	3
Mathematics Requirement[2]	3
Social Science Requirement[3]	3
Elective	3
	18

ED (IN ED) 315 Integrating Computers into the Classroom	1
ED 426 Methods and Materials in Secondary Math.[5]	3
ED 498 Secondary Content Area Reading[5]	3
MTHSC 311 Linear Algebra	3
MTHSC 408 Topics in Geometry	3
Social Science Requirement[3]	3
Elective	2
	18

SENIOR YEAR

(Directed Teaching— Either Semester)

ED 458 Health Education	3
ED 471 The Exceptional Child	3
MTHSC 412 Introduction to Modern Algebra	3
MTHSC 453 Advanced Calculus I	3
SPCH 250 Public Speaking	3
Mathematics Requirement[2]	3
	18

ED 412 Directed Teaching	12
	12

136 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]Any 200-400 level mathematics course, except MTHSC 207, 210, 215, 216.
[3]Economics (including AP EC 202) geography, political science, psychology, sociology.
[4]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.
[5]To be taken the semester prior to Directed Teaching.

SCIENCE TEACHING

The program leading to a Bachelor of Science degree in Science Teaching is designed for students planning to teach biological sciences, chemistry, earth science, or physical sciences on the secondary school level (grades 9-12). The required science electives are included to give some degree of competency in a field other than the major area. Students are urged to discuss the NTE with their adviser upon completion of the sophomore year.

TEACHING AREA: BIOLOGICAL SCIENCES

FRESHMAN YEAR

First Semester

CH 101 General Chemistry	4
CP SC 105 Essential Computer Skills	1
ED 100 Orientation	1
ENGL 101 Composition I	3
HIST 172 Western Civilization	3
MTHSC 106 Calculus of One Variable I	4
	16

Second Semester

CH 112 General Chemistry	4
ENGL 102 Composition II	3
HIST 173 Western Civilization	3
MTHSC 301 Statistical Theory and Methods I	3
or MTHSC 108 Calculus of One Variable II	4
Elective	3
	16-17

SOPHOMORE YEAR

BIOL 110 Principles of Biology I	5
CH 201 Survey of Organic Chemistry	4
or CH 330 Introduction to Physical Chemistry	3
ED 301 Principles of American Education	3
ED (IN ED) 315 Integrating Computers into the Classroom	1
PHYS 207 General Chemistry I	4
	16-17

BIOCH 210 Elementary Biochemistry	4
BIOL 111 Principles of Biology II	5
ED 302 Educational Psychology	3
PHYS 208 General Physics II	4
SPCH 250 Public Speaking	3
	19

JUNIOR YEAR

ED 335 Adolescent Growth and Development	3
GEN 302 Introductory Genetics	4
HUM 301 or 302 Humanities[8]	3
Plant Diversity Requirement[6]	4
Social Science Requirement[2]	3
	17

ED 427 Methods and Materials in Sec. Science[7]	3
ED 498 Secondary Content Area Reading[7]	3
Animal Diversity Requirement[4]	4
Physiology Requirement[3]	4-8
Social Science Requirement[2]	3
	17-21

SENIOR YEAR
(Directed Teaching—Either Semester)

ED 458 Health Education	3	ED 412 Directed Teaching	12
ED 471 The Exceptional Child	3	Elective	3
Biology Requirement[5]	4		15
Literature Requirement[1]	3		
Elective	4		
	17		

133 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]Anthropology, economics (including AP EC 202), geography, political science, psychology, sociology.
[3]Select from BOT 421 or ZOOL 459 or both BIOSC 222 and 223.
[4]Select from BIOSC 302 or 303.
[5]Select from BIOSC 435 or 441 or ZOOL 456 or 470/471 or MICRO 305.
[6]Select from BIOSC 304 or 305.
[7]To be taken the semester prior to Directed Teaching.
[8]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.
Note: This curriculum leads to South Carolina certification to teach all science subjects in grades 9-12 and permits teaching science in departmentalized middle and junior high schools, but provides special expertise for teaching middle school life science and senior high school biological sciences.

TEACHING AREA: EARTH SCIENCE

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
CH 101 General Chemistry	4	CH 102 General Chemistry	4
CP SC 105 Essential Computer Skills	1	ED 100 Orientation	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 301 Stat. Theory and Methods I	3
	16	or MTHSC 108 Calculus of One Variable II	4
			15-16

SOPHOMORE YEAR

ED 301 Principles of American Education	3	ED 302 Educational Psychology	3
GEOL 101 Physical Geology	3	GEOL 102 Historical Geology	3
GEOL 103 Physical Geology Lab	1	GEOL 104 Historical Geology Lab	1
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Literature Requirement[1]	3	SPCH 250 Public Speaking	3
	17		17

JUNIOR YEAR

ASTR 101 Solar System Astronomy	3	ED (IN ED) 315 Integrating Computers	
ASTR 103 Solar System Astronomy Lab	1	into the Classroom	1
ED 335 Adolescent Growth and Development	3	ED 427 Methods and Mat. in Sec. Science[4]	3
GEOL 306 Mineralogy	3	ED 498 Secondary Content Area Reading[4]	3
HUM 301 or 302 Humanities[5]	3	PHYS 240 Physics of the Weather	3
Elective	3	Geology Requirement[3]	3-4
	16	Social Science Requirement[2]	3
			16-17

SENIOR YEAR
(Directed Teaching—Either Semester)

ASTR 102 Stellar Astronomy	3	ED 412 Directed Teaching	12
ASTR 104 Stellar Astronomy Lab	1	Elective	3
ED 458 Health Education	3		15
ED 471 The Exceptional Child	3		
Social Science Requirement[2]	3		
Elective	4		
	17		

129 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]Anthropology, economics (including AP EC 202), geography, political science, psychology, sociology.
[3]GEOL 309, 400, 402, 403, 405.
[4]To be taken the semester prior to Directed Teaching.
[5]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.
Note: This curriculum leads to South Carolina certification to teach all science subjects in grades 9-12 and permits teaching science in departmentalized middle and junior high schools, but provides special expertise for secondary earth sciences.

TEACHING AREA: PHYSICAL SCIENCES

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
CP SC 105 Essential Computer Skills	1	CH 205 Introduction to Inorganic Chemistry	2
ENGL 101 Composition I	3	ED 100 Orientation	1
HIST 172 Western Civilization	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	HIST 173 Western Civilization	3
Elective	1	MTHSC 108 Calculus of One Variable II	4
	16		17

SOPHOMORE YEAR

BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
CH 201 Survey of Organic Chemistry	4	ED 302 Educational Psychology	3
ED 301 Principles of American Education	3	PHYS 122 Physics with Calculus I	3
ED (IN ED) 315 Integrating Computers into the Classroom	1	PHYS 124 Physics Lab. I	1
MTHSC 301 Statistical Theory and Methods I	3	SPCH 250 Public Speaking	3
PHYS 101 Current Topics in Modern Physics	1	Elective	3
	16		17

JUNIOR YEAR

ED 335 Adolescent Growth and Development	3	ED 427 Methods and Mat. in Sec. Science[4]	3
HUM 301 or 308 Humanities[5]	3	ED 498 Secondary Content Area Reading[4]	3
PHYS 221 Physics with Calculus II	3	PHYS 222 Physics with Calculus III	3
PHYS 223 Physics Laboratory II	1	PHYS 224 Physics Lab. III	1
Astronomy Requirement[3]	3-4	PHYS 240 Physics of the Weather	3
Social Science Requirement[2]	3	Elective	3
	16-17		16

SENIOR YEAR

(Directed Teaching—Either Semester)

CH 313 Quantitative Analysis	3	ED 412 Directed Teaching	12
CH 317 Quantitative Analysis Lab	1	Elective	3
ED 458 Health Education	3		15
ED 471 The Exceptional Child	3		
Literature Requirement[1]	3		
Social Science Requirement[2]	3		
	16		

129 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]Anthropology, economics (including AP EC 202), geography, political science, psychology, sociology.
[3]Select from ASTR 101/103 or ASTR (GEOL) 220.
[4]To be taken the semester prior to Directed Teaching.
[5]This requirement may also be satisfied by completing A A H 210 and MUSIC 210 or 311. In this case, the additional 3 credits will be recorded as electives.

Note: This curriculum leads to South Carolina certification to teach all science subjects in grades 9-12 and permits teaching science in departmentalized middle and junior high schools, but provides special expertise for teaching senior high school chemistry, physics, and physical sciences.

COLLEGE OF ENGINEERING

The College of Engineering offers eight professional Bachelor of Science degree programs: Agricultural Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering; and a Bachelor of Science degree program in Engineering Analysis. Each of the engineering programs offered leads to a wide range of career opportunities and serves as preparation for further study at the graduate level.

PROFESSIONAL CURRICULA

Each of the eight professional curricula is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, the recognized national accrediting agency for professional curricula in engineering. The curriculum in Agricultural Engineering is jointly administered by the College of Agricultural Sciences and the College of Engineering.

Although the College of Engineering does not offer specific options or majors in each of these professional curricula, the instruction includes many phases of each respective field. Thus, a civil engineering student is graduated in civil engineering rather than in structural engineering, highway engineering, sanitary engineering, or other such options. However, a student who wishes to study within the areas encompassed by these options will find adequate courses within the Civil Engineering curriculum to prepare for work in any of these areas. In the same way, the other engineering curricula include thorough education in various phases of the field of specialization without overemphasizing one phase to the neglect of others. The professional curricula lead to a Bachelor of Science degree in the specific professional area.

MINORS

In addition to the major, students in the Bachelor of Science degree programs may select a minor area of study. By careful selection of electives, engineering students often may complete a minor course of study within the semester hour requirement of the major. Students should consult with their advisers for additional details. (See page 60 for minors.)

POLICY ON TRANSFER FROM THE FRESHMAN ENGINEERING PROGRAM TO A PROFESSIONAL PROGRAM IN THE COLLEGE OF ENGINEERING

To transfer from the freshman engineering program to one of the eight professional-oriented curricula or to Engineering Analysis, a student must complete the freshman curriculum and achieve an overall 2.0 grade-point ratio. The transfer request must be initiated by the student during the semester in which he/she expects to complete the freshman curriculum and prior to preregistration. Students who fail to meet requirements for transfer to a professional curriculum may remain in the freshman engineering program to establish transfer eligibility, but cannot enroll in engineering courses other than C E 201, CR E 310, E G 208, 209, E M 201, 202, ENGR

180. A student transferring to an engineering degree program will follow the curriculum that is in place at the time of transfer.

POLICY ON HUMANITIES AND SOCIAL SCIENCES FOR ENGINEERING CURRICULA

To ensure that young engineers are aware of their responsibilities to society and are able to consider societal factors in the decision-making process, courses in the humanities and social sciences must be an integral part of their education. While there are many humanistic/social science courses that may be of interest and value to the engineering student, the objectives of the profession require the concentration of some courses in one or two areas rather than a selection of totally unrelated, introductory courses in different areas.

To meet these professional objectives, a student must have accumulated a minimum of 16 credit hours in the humanities and social sciences. These credits must satisfy the following criteria:

1. Either
   a) Nine credit hours in a given subject area
   or
   b) Six credit hours in each of two different subject areas.
2. A minimum of 6 credit hours in humanities, which must include the following:
   a) Three credit hours selected from sophomore literature courses (200 level) or foreign language literature (300 level or higher).
   b) Three credit hours selected from the following (excluding skills courses): art and architectural history, drama, foreign language literature (300 level or higher), humanities, music, philosophy, religion, or sophomore literature courses (200 level), and visual arts.
3. A minimum of 6 credit hours in social sciences, selected from anthropology, economics, geography, history, political science, psychology, and sociology (including crosslisted rural sociology courses).

Additional requirements (e.g., an economics or second literature course) may be specified by individual departments. Students should consult with their academic advisers for details.

The courses which can be taken to satisfy requirements 1, 2, and 3 above must be selected from the approved list available from the departmental adviser.

POLICY ON ELECTIVES FOR THE ENGINEERING CURRICULUM

Class advisers must approve any course taken for elective credit in the Engineering curricula. Courses excluded for elective credit in the Engineering curricula are as follows: ENGL 100, MTHSC 101, 102, 104, 105, 115, 116, 215, 216, PHYS 207, 208.

REGISTRATION REQUIREMENTS

A cumulative grade-point ratio of 2.0 or higher is required for registration in all engineering courses numbered 300 or higher. For registration in all engineering courses, preference is given to those majors for whom the course is a degree requirement, until early registration is open for all

students. Exceptions to this policy may be granted by the department offering the course.

GRADUATION REQUIREMENTS

In addition to other institutional requirements, the following will apply to all candidates for a baccalaureate degree in Engineering. For graduation, candidates will be required to have a 2.0 or higher cumulative grade-point ratio in all engineering courses taken at Clemson University. All of these courses exclusively utilize the word "Engineering" in the course designator (i.e., AG E 221, M E 493, etc.).

DEGREE PROGRAMS

The baccalaureate degree programs offered by the College of Engineering are described below. The programs are designed to be completed within four years (8 regular semesters). Taking a reduced course load or participating in cooperative education will extend this time. On average, Clemson engineering students take approximately four and one-half years to complete the requirements for graduation.

FRESHMAN YEAR PROGRAM

All first-year engineering students are admitted to the University into the Freshman Engineering Program rather than specific professional engineering curricula. Students in the Freshman Engineering Program pursue a common curriculum which forms the first year for all nine engineering degree-granting curricula available at Clemson.

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry[3]	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
ENGR 180 Computers in Engineering[1]	3	ENGR 101 Introduction to Engineering[1]	1
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
Humanities/Social Science Requirement[2]	3	PHYS 122 Physics with Calculus I	3
	17	Elective	3
			18

[1]One-half of the entering freshman class will enroll during the first semester, the other one-half will enroll during the second semester.
[2]See Policy on Humanities and Social Sciences for Engineering Curricula, page 130.
[3]See adviser.

ENGINEERING ANALYSIS

This curriculum is a four-year engineering science-oriented course of study. Its objectives are twofold. These are (1) to prepare students for employment or graduate study in areas of engineering that are not available in the college at the undergraduate level; and (2) to provide a flexible and broadly-based engineering program for students preparing to work in other professions.

The curriculum leads to the Bachelor of Science degree in Engineering Analysis. Requirements for this degree are stated in terms of subject matter area rather than in terms of specific courses. Degree requirements are as follows:

See page 131 for Freshman year.

	Hours Credit
Area of Concentration	12
Basic Science (including 8 hours of physics)	16
Engineering Science	33
Humanities/Social Science Requirement	32
Mathematical Sciences (including 12 hours of post-calculus mathematical sciences)	24
Electives	22
Total Semester Hours	139

The educational objectives of the program will be met by the selection of an area of concentration which will be chosen from several specialty areas offered within the professional engineering curricula. The selection of specific courses, particularly in the junior and senior years, will then depend primarily on the choice of the area of concentration. By judicious selection of courses within this flexible structure, a student will be prepared for entry into the professional schools of law and medicine.

Maximum flexibility within this program is achieved by permitting a student to defer his choice of specialization until the junior year or later. Such deferral will then allow students from junior and senior colleges not offering engineering to transfer into the program with little or no loss in academic credit.

AGRICULTURAL ENGINEERING

Graduates in Agricultural Engineering are well-equipped to apply engineering to many functions affecting the well-being of mankind. They have broad training in mathematics, physics, chemistry, and biological sciences as well as comprehensive coverage of the engineering sciences. Agricultural engineers are sought by industry and public service organizations primarily for their ability to apply engineering expertise to living systems and to the management of land and water resources. Specific areas of emphasis are as follows:

1. Agricultural Production and Consumer Products Engineering
2. Biotechnology Engineering
3. Food Engineering
4. Natural Resources Engineering

This curriculum includes courses in such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analysis. Courses in the basic sciences appropriate to the areas of emphasis provide a foundation for engineering design and development and for the management of biological systems. In addition, important facets of energy conversion, research methods, use of economy and integrity in design and protection, modification, and control of the environment are included.

Graduate programs lead to the Master of Science, Master of Engineering, and Doctor of Philosophy degrees.

Opportunities for employment of agricultural engineering graduates include design, research, production and sales with industry plus teaching, research, extension, and field engineering with governmental agencies.

Note: Additional information concerning the Engineering Analysis curriculum is available in the Office of the Dean of Engineering.

Agricultural engineers are also equipped for self-employment as consulting engineers or as owners of businesses providing engineering services and related products.

See page 131 for Freshman year. See pages 72-74 for separate emphasis curricula under Agricultural Engineering in the College of Agricultural Sciences.

SOPHOMORE YEAR

First Semester		Second Semester	
AG E 221 Survey for Soil and Water Res.[3,4]	2	AG E 214 Fab. and Mfg. Meth. for Ag. Sys	2
CH 201 Survey of Organic Chemistry[2,5]	4	BIOCH 301 General Biochemistry[2,5]	3
E G 209 Intro. to Engr./Comp. Graphics	2	BIOCH 302 Molecular Biol. Lab.[2,5]	1
E M 201 Engineering Mechanics: Statics	3	ECON 211 Principles of Microeconomics[1,3,4]	3
MTHSC 206 Calculus of Sev. Var	4	or ECON 200 Economic Concepts[1,3,4]	3
PHYS 221 Physics with Cal. II	3	E M 202 Engineering Mechanics: Dynamics	3
Elective[2,5]	1	MTHSC 208 Intro. to Ord. Diff. Equa	4
Elective[3,4]	3	PHYS 222 Physics with Cal. III	3
	17-18	Literature Requirement[1,3,4]	3
		Elective[2,5]	2
			18

JUNIOR YEAR

AG E 356 Mach. Op. for Ag. and Biol. Sys.[2,3,4]	3	AG E 322 Small Watershed Hyd. and Sed.[3,4]	2
E C E 307 Basic Electrical Engineering	2	AG E 333 Environ. Mod. and Cont. for Agric. and Biological Systems	2
E C E 309 Electrical Engineering Lab. I	1	AG E 350 Microcomp. Controls in Biosys	2
ECON 211 Principles of Microeconomics[1,2]	3	AG E 362 Energy Conv. in Ag. and Biol. Sys	3
or ECON 200 Economic Concepts[1]	3	AG E (BIOSC) 430 Engr. Modeling of Biol. Sys	3
E M 304 Mechanics of Materials	3	AGRON 202 Soils[3,4]	4
M E 310 Thermodynamics and Heat Transfer	3	E M 304 Mechanics of Materials	3
MICRO 305 General Microbiology[5]	4	or EM 322 Fluid Mechanics Lab	1
Biological Sciences Requirement[4]	4	E M 320 Fluid Mechanics	3
Literature Requirement[1,2,5]	3	ENGL 314 Technical Writing[1]	3
Mathematics Requirement[1,3,4,5]	3	or SPCH 250 Public Speaking[1]	3
Plant/Animal Science Requirement[1,3]	3	MICRO 305 General Microbiology[2]	4
	18-19	Elective[2]	2
		Elective[5]	1
			19-20

SENIOR YEAR

AG E 416 Mech. Des. for Ag. and Biol. Sys	3	AG E 364 Agric. Waste Mgt. Sys.[4]	2
AG E 450 Instru. for Ag. and Biol. Sys	3	AG E 421 Engr. Sys. for Soil Wat. Mgt.[3,4,5]	2
AG E 471 Engr. Research and Management	2	AG E 429 Appl. in Biotech. Engr.[2,5]	3
CH E (AG E) 428 Biochemical Engineering[2,5]	3	AG E 431 Agric. Struc. and Environ. Des.[2,3,4]	3
FD SC 401 Food Chemistry [2]	4	AG E 442 Prop. and Proc. of Biol. Prod.[2,3,5]	3
I E 384 Engineering Economic Analysis[3]	3	ECON 211 Principles of Microeconomics[1,5]	3
Approved Engineering Requirement[1,4]	3	or ECON 200 Economic Concept[1,5]	3
Humanities/Social Science Requirement[6]	3	MICRO 407 Food and Dairy Microbiology[2]	4
Science Requirement[1,4]	3	Approved Emphasis Requirement[2]	2
Technical Requirement[3]	3	Approved Engineering Requirement[1]	1
	17-18	Humanities/Social Science Requirement[6]	3
		Technical Requirement[1,3,4]	3
		Elective[1,3,4]	4
		Elective[2,5]	2
			16-18

143 Total Semester Hours

[1]See adviser.
[2]Food Engineering Emphasis. (See page 74.)
[3]Agricultural Production and Consumer Products Engineering Emphasis. (See page 72.)
[4]Natural Resources Engineering Emphasis. (See page 74)
[5]Biotechnology Engineering Emphasis. (See page 73.)
[6]See Policy on Humanities and Social Sciences for Engineering Curricula, page 130.

CERAMIC ENGINEERING

Ceramic engineers are producers of ceramic products. Ceramic engineers provide the professional engineering skills and talent necessary for research, design, production supervision, technical sales and management. Ceramics covers an extremely broad range of products. Common brick, window glass, wall and floor tile, dinner plates, bathroom fixtures, glass bottles, optical fiber

glass, ceramic bones and teeth, solid-state electronic devices, nuclear fuel, machine tool bits, automotive engine valves, textile thread guides, and helicopter rotor blades are illustrations of the wide product line from a $40 billion a year ceramic industry.

The curriculum has about 75 percent of the coursework devoted to general and background material common to all engineering disciplines. The core courses cover mathematics, basic sciences, engineering sciences, humanities and social sciences. The remaining 25 percent allows specialization in ceramic engineering topics. The specialization allows you to study nonmetallic minerals, high-temperature chemistry, processing from raw materials to finished product and material and product characterization.

The program leads to the Bachelor of Ceramic Engineering. Advanced degrees are available with further study.

See page 131 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CR E 202 Processing Ceramic Raw Materials into Products	3	CR E 201 Intro. to Ceramic Engineering	2
CR E 204 Laboratory Procedures	2	MTHSC 208 Intro. to Ord. Diff. Equa	4
CR E 310 Intro. to Material Science	3	PHYS 222 Physics with Cal. III	3
MTHSC 206 Calculus of Sev. Var	4	Literature Requirement[1]	3
PHYS 221 Physics with Cal. II	3	Planned Requirement[2]	5
Literature Requirement[1]	3	Elective	1
	18		18

JUNIOR YEAR

CH 331 Physical Chemistry	3	CR E 307 Thermal Processing of Ceramics	3
CR E 302 Thermo-Chemical Ceramics	3	CR E 309 Research Methods	2
CR E 304 Experimental Design	3	CR E 311 Kinetics of Mat. Processes	3
E C E 307 Basic Electrical Engineering	2	Planned Requirement[2]	6
E C E 309 Electrical Engineering Lab. I	1	Elective	3
E M 201 Engr. Mechanics: Statics	3		17
Planned Requirement[2]	3		
	18		

SENIOR YEAR

CR E 402 Solid State Ceramics	3	CR E 403 Glasses	3
E M 304 Mechanics of Materials	3	Planned Requirement[2]	12
SPCH 250 Public Speaking	3		15
Planned Requirement[2]	6		
Elective	3		
	18		

139 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]Nine credits of Planned Requirements must be taken in humanities/social science courses. Twenty-three credits of Planned requirements should be technical courses selected with the help of class adviser.

CHEMICAL ENGINEERING

Chemical Engineering is unique in that it is based on the three sciences of chemistry, physics, and mathematics. The curriculum emphasizes a broad range of fundamental principles in science and engineering, as well as communications skills and humanities, rather than a narrow specialization. As a result, graduates are avidly sought by industries in many areas of technology such as petrochemicals and petroleum, synthetic fibers and textiles, pharmaceuticals, pulp and paper, computers, foods, metals, ceramics, instrumentation and automatic control, and nuclear fuels processing and power as well as the traditional chemical process industries. The chemical engineer is in the forefront of the fight against environmental pollution and

is leading the way in applying engineering technology to the solution of medical and health-related problems. Advanced structural materials, electronic and photonic devices, and biotechnology are just some of the exciting new fields in which chemical engineers are making pivotal contributions.

The chemical engineering graduate, because of his broad, fundamental background, is uniquely prepared for a wide variety of careers in which he can apply his abilities and education. Chemical engineers may work in basic research and development, engineering design of new plants, operations and management of production facilities, or technical marketing and sales. The careers of many chemical engineers lead to top executive positions in their companies. By the judicious choice of electives made with the help of his adviser, a chemical engineering student may tailor his education to further a specific career objective. Many students use electives to prepare for entry into professional schools, such as medicine, dentistry, law, or business, or for specialization in technical areas such as environmental control or polymer processing. The Department of Chemical Engineering offers advanced study leading to the Master of Science and Doctor of Philosophy degrees.

See page 131 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH E 201 Intro. to Chem. Engr	3	CH 229 Organic Chemistry Lab	1
E G 209 Intro. to Engr/Comp. Graphics	2	CH E 220 Chemical Engr. Thermodynamics I	3
MTHSC 206 Calculus of Sev. Var	4	CH E 252 Process Modeling and Numerical Method	2
PHYS 221 Physics with Cal. II	3	E M 201 Engr. Mechanics: Statics	3
Literature Requirement[1]	3	MTHSC 208 Intro. to Ord. Diff. Equa	4
	18	Literature Requirement[1]	3
			19

JUNIOR YEAR

CH 331 Physical Chemistry	3	CH 332 Physical Chemistry	3
CH 339 Physical Chemistry Lab	1	CH 340 Physical Chemistry Lab	1
CH E 301 Unit Operations I	3	CH E 302 Unit Operations II	3
CH E 319 Engineering Materials	2	CH E 306 Unit Operations Lab. I	2
E C E 307 Basic Electrical Engineering	2	CH E 321 Chem. Engr. Thermo. II	3
E C E 309 Electrical Engineering Lab. I	1	CH E 353 Process Dynamics and Control	3
E M 304 Mechanics of Materials	3	EX ST 411 Stat. Meth. for Process Dev. and Control	3
SPCH 250 Public Speaking	3	or MTHSC 302 Stat. for Science and Engr	3
	18		18

SENIOR YEAR

CH E 403 Unit Operations III	3	CH E 401 Transport Phenomena	3
CH E 407 Unit Op. Lab. II	3	CH E 432 Process Dev., Design and Optimization of Chem. Engr. Sys. II	5
CH E 431 Process Dev., Design and Optimization of Chem. Engr. Sys. I	3	CH E 444 Chem. Engr. Senior Seminar II	1
CH E 443 Chem. Engr. Senior Seminar I	1	Humanities/Social Science Requirement[2]	2
CH E 450 Chemical Reaction Engineering	3	Elective	7
Humantities/Social Science Requirement[2]	6		18
	19		

145 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]See Policy on Humanities and Social Sciences for Engineering Curricula. (Seventeen credits are required, including 6 credits of literature courses in the sophomore year.)
Note: Ten hours of free electives are required.

CIVIL ENGINEERING

Civil Engineering involves the planning, design, construction, maintenance, and operation of facilities and systems to control and improve the environment for modern civilization. Civil engineering is the broadest of the

engineering professions, being the stem from which most other branches of engineering have developed.

The program in Civil Engineering leads to the Bachelor of Science degree and is designed to provide the graduate with a knowledge of basic science, engineering science, and engineering design. The civil engineering graduate is prepared to work immediately upon graduation in most areas of the profession. These include traffic and transportation engineering, structural engineering, construction, soils and foundation engineering, coastal engineering, water resources engineering, public works engineering, environmental engineering, and others. The civil engineering student is also educated in the humanities, social sciences, and in economic issues, because a concerned society demands economy as well as a realistic consideration of the resulting human impacts of large engineering projects.

Graduates are encouraged to become registered professional engineers and to continue their education throughout their professional careers. Some students find that programs in Civil Engineering provide excellent preparation for careers in technical sales and management.

See page 131 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
C E 201 Surveying	3	E G 209 Intro. to Engr./Comp. Graphics	2
E M 201 Engineering Mechanics: Statics	3	E M 304 Mechanics of Materials	3
MTHSC 206 Calculus of Sev. Var	4	E M 305 Mechanics of Materials Lab	1
PHYS 221 Physics with Cal. II	3	MTHSC 208 Intro. to Ord. Diff. Equa	4
Literature Requirement[1]	3	PHYS 222 Physics with Cal. III	3
Elective	1	Literature Requirement[1]	3
	17	Elective	1
			17

JUNIOR YEAR

C E 301 Structural Analysis I	3	C E 302 Structural Steel Design	3
C E 305 Computational Method in Civil Engr	3	C E 310 Transportation Engineering	4
C E 320 Intro. to Cons. Materials	3	C E 324 Intro. to Construction Engr	3
E M 202 Engr. Mechanics: Dynamics	3	E M 320 Fluid Mechanics	3
ENGL 314 Technical Writing	3	E M 322 Fluid Mechanics Lab	1
EX ST 301 Introductory Statistics	3	E S E 401 Environmental Engineering	3
	18		17

SENIOR YEAR

C E 330 Soil Mechanics	4	C E 402 Reinforced Concrete Design	3
C E 422 Hydraulics and Hydrology	3	C E 425 Civil Engineering Project Evaluation	3
E C E 307 Basic Electrical Engineering	2	M E 310 Thermo. and Heat Transfer	3
E C E 309 Electrical Engineering Lab. I	1	Humanities/Social Science Requirement[2]	3
ECON 200 Economic Concepts	3	Technical Requirement[2]	3
or ECON 211 Principles of Microeconomics	3	Elective	3
or ECON 212 Principles of Macroeconomics	3		18
Technical Requirement[2]	3		
Elective	2		
	18		

140 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]See adviser for list of approved Technical Requirements and Humanities/Social Science Requirements.
Note: Civil Engineering students may enroll in 300 level and higher civil engineering or engineering mechanics courses only if they have a grade of C or higher in the immediate prerequisite.

COMPUTER ENGINEERING

The program in Computer Engineering leads to a Bachelor of Science degree which provides an in-depth education into a wide range of computer topics including computer hardware, software and applications. Emphasis is

placed on giving students hands-on experience with computers of all sizes (micro, mini, and large) by solving a wide range of real-world problems using engineering principles.

The career opportunities for computer engineers are excellent. The rapid advances in microelectronics and growth of microcomputer applications, as well as continued expansion of large computer systems, indicate that this strong demand will continue.

The curriculum is based on three main concepts: (1) It is an engineering curriculum which provides a solid foundation in mathematics, basic sciences, and the humanistics while emphasizing the engineering approach to problem solving. (2) The required computer courses provide an excellent knowledge of hardware, software, and systems. (3) A large number of elective hours are provided which allows students to specialize in one or more computer areas. The Computer Engineering program prepares a student for entering the engineering profession in a rapidly advancing area, and it provides a good background for study in other professions.

See page 131 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CP SC 210 Programming Methodology	4	E C E 212 Electrical Engineering Lab. II	1
E C E 201 Logic and Computing Devices	3	E C E 262 Electric Circuits II	3
E C E 202 Electric Circuits I	3	E C E 272 Computer Organization	4
E C E 211 Electrical Engineering Lab. I	1	MTHSC 208 Intro. to Ord. Diff. Equations	4
MTHSC 206 Calculus of Sev. Var	4	MTHSC 311 Linear Algebra	3
PHYS 221 Physics with Cal. II	3	Humanities/Social Science Requirement[1]	3
PHYS 223 Physics Lab. II	1		18
	19		

JUNIOR YEAR

CP SC 240 Intro. to Data Structures	3	E C E 329 Computer Systems Structures	3
E C E 311 Electrical Engineering Lab. III	1	ECON 200 Economic Concepts	3
E C E 320 Electronics I	3	or ECON 211 Principles of Microeconomics	3
E C E 330 Signals, Systems, and Transforms	3	or ECON 212 Principles of Macroeconomics	3
E C E 371 Microcomputer Interfacing	4	ENGL 314 Technical Writing	3
MTHSC 419 Discrete Mathematical Structures I	3	or SPCH 250 Public Speaking	3
	17	MTHSC 400 Theory of Probability	3
		Engineering Science Requirement[2]	3
		Humanities/Social Science Requirement[1]	3
			18

SENIOR YEAR

E C E 417 Software Design	3	E C E 452 Programming Systems	3
E C E 426 Digital Computer Design	3	E C E 453 Software Practicum	3
Application Sequence Requirement[2,3]	3	Computer Engineering Requirement[2,3]	3
Design Requirement[2,3]	3	Literature Requirement[4]	3
Humanities/Social Science Requirement[1]	3	Design Requirement[2,3]	3
Elective	4	Elective	3
	19		18

144 Total Semester Hours

[1]See General Education Requirements.
[2]Application Sequence Requirements, Computer Engineering Requirements, Design Requirements, and Engineering Science Requirements must be chosen from a list of courses approved by the Department.
[3]One course that satisfies either the Design Requirement, Application Sequence Requirement, or Computer Engineering Requirement must also satisfy the Probability and Statistics Requirement. (The Probability and Statistics Requirement is specified by a list of courses approved by the Department.)
[4]ENGL 202, 203, 204,. 205, 206, 207, 208, 209.
Note: A student is allowed to enroll in electrical and computer engineering courses (excluding E C E 307, 308, 309, 310) only when all prerequisites, as defined by current official listings for that course, have been passed with a grade of C or higher.

ELECTRICAL ENGINEERING

Responsibilities of the electrical engineering profession range from highly

analytical problem solving to detailed design. The Electrical Engineering program is intended to emphasize both the close relationship of computers to all phases of the profession and the major role that computers play in the curriculum at Clemson.

Systems, electronic networks, and electromagnetic fields provide the core curriculum areas. These fundamental studies in analysis and experimentation receive further development in elective courses. Humanistic/social electives provide the graduate with the ability to address himself to the "why" of engineering as well as the "how."

Students who are interested in communications study information theory, electromagnetic theory, switching circuits, and electronics.

Technological innovations in electronics have resulted in increasingly complex solid-state components—the transistor, integrated circuit, and LSI component. The electronics emphasis includes solid-state devices and circuits and integrated circuit technology.

The department offers courses in real-time computing, computer language structures, theory and design of digital computers, computation and simulation of physical systems, and information processing and data handling.

Energy systems analysis and energy conversion are appropriate for students who plan to work for electric utilities, electrical equipment manufacturers, or companies which are large users of electrical energy.

See page 131 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CP SC 157 Intro. to C Programming	1	E C E 212 Electrical Engineering Lab. II	1
E C E 201 Logic and Computing Devices	3	E C E 262 Electric Circuits II	3
E C E 202 Electric Circuits I	3	E C E 272 Computer Organization	4
E C E 211 Electrical Engineering Lab. I	1	ECON 211 Principles of Microeconomics	3
MTHSC 206 Calculus of Sev. Var	4	or ECON 212 Principles of Macroeconomics	3
PHYS 221 Physics with Cal. II	3	EM 201 Engineering Mechanics: Statics	3
Literature Requirement[1]	3	MTHSC 208 Intro. to Ord. Diff. Equations	4
	18		18

JUNIOR YEAR

E C E 311 Electrical Engineering Lab. III	1	E C E 312 Electrical Engineering Lab. IV	1
E C E 320 Electronics I	3	E C E 317 Random Signal Analysis	3
E C E 330 Signals, Systems, and Transforms	3	E C E 321 Electronics II	3
E C E 371 Microcomputer Interfacing	4	E C E 360 Electrical Power Engineering	3
E C E 380 Electromagnetics	3	E C E 381 Field, Waves, and Circuits	3
Humanities/Social Science Requirement[2]	3	ENGL 314 Technical Writing	3
Elective	1	Technical Requirement (Advanced Mathematics)[3]	3
	18		19

SENIOR YEAR

E C E 409 Continuous and Discrete Systems Design	3	E C E 496 Integrated System Design II	2
E C E 427 Communication Systems	3	Humanities/Social Science Requirement[2]	3
E C E 495 Integrated System Design I	2	Technical Requirement (Elec. and Comp. Engr.)[3]	3
M E 310 Thermodynamics and Heat Transfer	3	Elective	6
Humanities/Social Science Requirement[2]	3		14
Technical Requirement (Elec. and Comp. Engr.)[3]	3		
	17		

139 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]See Policy on Humanities and Social Sciences for Engineering Curricula.
[3]The Technical Requirement (Advanced Mathematics) and Technical Requirement (Electrical and Computer Engineering) are to be selected from lists that are maintained in the Electrical Engineering Program Office.
Note: A student is allowed to enroll in electrical and computer engineering courses (excluding E C E 307, 308, 309, 310) only when all prerequisites have been passed with a grade of C or higher.

INDUSTRIAL ENGINEERING

Industrial engineers design, install, and improve the complex systems which provide both goods and services vital to our society and economy. These systems integrate people, materials, and equipment and thereby place unique demands for breadth of preparation upon industrial engineers. Knowledge is required in mathematical, physical, and social sciences; economic, operational, and engineering analyses; and the principles and techniques of engineering design. Because of the closeness of industrial engineering problems to management, a special need exists for industrial engineers to be able to work and communicate with managers.

The traditional arenas for the practice of industrial engineering are the manufacturing facilities of industry. However, today fully one-third of practicing industrial engineers are employed in nonmanufacturing institutions such as hospitals and banks and in government service.

In addition to numerous employment opportunities in South Carolina and other states, an industrial engineering graduate may pursue further formal education. The Department of Industrial Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees.

See page 131 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
E G 209 Intro. to Engr./Comp. Graphics	2	E M 201 Engineering Mechanics: Statics	3
I E 201 Systems Design I	3	I E 210 Work Methods and Measurement I	3
MTHSC 206 Calculus of Several Variables	4	I E 250 Modeling and Analysis for Industrial Engineers	3
MTHSC 302 Statistics for Science and Engineering	3	MTHSC 208 Intro. to Ordinary Dif. Equations	4
PHYS 221 Physics with Calculus II	3	MTHSC 405 Stat. Theory and Methods II	3
Literature Requirement[2]	3	Communications Requirement[3]	3
	18		19

JUNIOR YEAR

E C E 307 Basic Electrical Engineering	2	E M 202 Engineering Mechanics: Dynamics	3
E C E 309 Electrical Engineering Lab. I	1	or E M 304 Mechanics of Materials	3
ECON 200 Economic Concepts	3	I E 361 Industrial Quality Control	3
I E 306 Manufacturing Processes	3	I E 374 Advanced Manufacturing Systems	3
I E 380 Methods of Operation Research I	3	I E 381 Methods of Operation Research II	3
M E 310 Thermodynamics and Heat Transfer	3	I E 384 Engineering Economic Analysis	3
Humanities/Social Science Requirement[1]	3	Humanities/Social Science Requirement[1]	3
	18		18

SENIOR YEAR

I E 482 Systems Modeling	3	I E 465 Facilities Planning and Design	3
I E 486 Production Planning and Control	3	I E 467 Systems Design II	3
I E 488 Human Factors Engineering	3	Industrial Engineering Technical Elective[4]	3
Humanities/Social Science Requirement[1]	3	Elective	7
Industrial Engineering Technical Elective[4]	3		16
	15		

139 Total Semester Hours

[1]See adviser.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209, H210.
[3]ENGL 231, 312, 314, 316, SPCH 250.
[4]Select from approved list.

Notes:

1. *Baccalaureate Degree Requirement* In each industrial engineering course taken, a student must make a grade of C or higher.
2. *Course Enrollment Requirement* A student is allowed to enroll in industrial engineering courses only when all prerequisites, as defined by the current official listings for those courses, have been passed with a grade of C or higher.

MECHANICAL ENGINEERING

Breadth, individuality, and flexibility are inherent characteristics of the profession of mechanical engineering. Mechanical engineers, in a broad sense, make major contributions to the creation of products and systems that bene-

fit mankind. They work in a wide variety of areas including bioengineering, energy systems, environmental and life-support systems, propulsion and transportation systems, food production, materials processing, automated manufacturing, and construction. A wide spectrum of career opportunities are open to them.

The practice of mechanical engineering includes one or more of the following activities: manufacturing, testing, research, development, design, technical management, technical sales and marketing, construction, and teaching.

In preparing for a 40-45 year professional career, it is necessary to develop the whole person. This requires a balanced program encompassing the humanities, social sciences, communication and computer skills, physical and engineering sciences, design, and laboratory experience. The student starts with the physical sciences and communication skills and progresses through the engineering sciences, ultimately applying the principles learned in such areas as energy conversion and transfer, mechanical design, and systems analysis. Throughout the curriculum, the fundamental nature of engineering as a problem-solving discipline is emphasized.

Most mechanical engineering graduates take positions in industry, government, or business. Many, however, continue their formal education in a graduate program. The Department of Mechanical Engineering offers study leading to the Master of Engineering, Master of Science, and Doctor of Philosophy degrees.

See page 131 for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
E G 208 Engr. Graphics with Computer Appl	3	E M 202 Engr. Mechanics: Dynamics	3
E M 201 Engr. Mechanics: Statics	3	M E 204 Manufacturing Proc. for Engr. Mat. I	3
M E 201 Foundations of Engr. Design	3	M E 208 Numerical Methods in Engr	3
MTHSC 206 Calculus of Several Variables	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
PHYS 221 Physics with Calculus II	3	PHYS 222 Physics with Calculus III	3
Humanities/Social Science Requirement[2]	3	Literature Requirement[1]	3
	19		19

JUNIOR YEAR

E C E 307 Basic Electrical Engineering	2	ENGL 314 Technical Writing	3
E C E 309 Electrical Engineering Lab. I	1	M E 304 Heat Transfer	3
E M 304 Mechanics of Materials	3	M E 306 Fundamentals of Machine Design	3
E M 305 Mechanics of Materials Lab	1	M E 312 Engineering Thermodynamics II	3
E M 320 Fluid Mechanics	3	M E 313 Instrumentation and Measurement	3
M E 302 Mechanical Systems and Vibrations	3	Humanities/Social Science Requirement[2]	3
M E 311 Engineering Thermo. I	3		18
Elective	1		
	17		

SENIOR YEAR

M E 400 Senior Seminar	1	E C E 308 Elec. and Electromechanics	2
M E 403 Manufacturing Processes for Engr. Mat. II	3	M E 402 Intern. in Engr. Design	3
M E 405 Kinematics and Design of Machinery I	3	M E 414 Mech. Sys. Lab	1
M E 409 Design of Thermal Fluid Systems	3	or M E 413 Thermal Sys. Lab	1
M E 413 Thermal Systems Lab	1	M E 416 Control of Mechanical Systems	3
or M E 414 Mech. Sys. Lab	1	Technical Requirement[3]	3
Humanities/Social Science Requirement[2]	3	Elective	6
Technical Requirement[3]	3		18
	17		

143 Total Semester Hours

[1]Select from 200-level English literature or 300-level foreign language literature courses.
[2]Select from a list of approved Humanities/Social Science courses.
[3]Select from the departmental list of approved courses with the assistance of a faculty adviser.
Note: A student is allowed to enroll in any mechanical engineering, engineering mechanics, or materials engineering course only when all prerequisites, as defined by current official listings for that course, have been passed with a grade of C or higher.

COLLEGE OF FOREST AND RECREATION RESOURCES

The College of Forest and Recreation Resources is concerned with the management, use, and stewardship of all our forest resources and with individual and societal well-being through wise use of leisure. These two general areas of study offer broad opportunities in the management of our forest and recreation resources for their maximum service to present and future generations.

The College of Forest and Recreation Resources offers curricula designed to prepare students for professional careers in the following areas:

1. The Forest Resource Management curriculum prepares graduates for employment as managers and administrators of forest lands for production of timber, water, wildlife, esthetic values, and recreation use.

2. The Forest Products curriculum prepares graduates for careers in the forest products and allied industries in the areas of production, utilization, and marketing of wood and allied products.

3. The Parks, Recreation, and Tourism Management curriculum prepares graduates for careers as managers of leisure-service programs such as those for counties, municipalities, institutions, voluntary and youth-serving agencies, and for numerous opportunities within the travel and tourism industry as well as resource management systems at local, state, and federal levels.

Minor concentrations are offered in Forest Resource Management and Forest Products.

FOREST PRODUCTS

The Forest Products curriculum combines a broad education in the sciences and humanities. Emphasis in the professional courses is placed on the properties and use of wood. Graduates are employed by wood-using industries and their suppliers, research laboratories, trade associations, and state and federal organizations.

The core curriculum allows for emphases in three areas of specialization: Wood Science, Wood Industries Management, and Forest Management. Wood Science deals with the properties and processing of wood, wood fiber, and products derived from wood. Wood Industries Management prepares students for the managerial aspects of forest products industries, including marketing and technical services. Twelve credit hours listed as emphasis areas in the core curriculum qualify a student as a participant in one of the two areas. The areas of interest could be explored in more depth through use of the remaining elective credits.

Successful completion of the curriculum leads to a Bachelor of Science degree in Forest Products. Graduate studies leading to the Master of Science, Master of Forest Resources, and Doctor of Philosophy degrees are also offered.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BOT 205 Plant Form and Function	4
CH 105 Beginning General and Organic Chemistry1	4	CH 106 Beginning General and Organic Chemistry1	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
FOR 101 Introduction to Forestry	1	FOR 102 Introduction to Forestry	1
MTHSC 102 Intro. to Math. Analysis2	3	MTHSC 207 Multivariable Calculus2	3
Elective	3	Elective	3
	18		18

SOPHOMORE YEAR

CP SC 120 Intro. to Info. Processing Sys	3	ECON 200 Economic Concepts	3
FOR 205 Dendrology	3	FOR 222 Wood Properties II	3
FOR 221 Wood Properties I	3	FOR 306 Wood And Wood Fiber Identification	2
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Literature Requirement[3]	3	Social Science Requirement[4]	3
	16	Elective	3
			18

FORESTRY SUMMER CAMP

FOR 254 Forest Products	1
FOR 255 Secondary Wood Products	1
FOR 257 Forest Products Measurements	2
	4

JUNIOR YEAR

ENGL 314 Technical Writing	3	FOR 311 Forest Prod. Marketing Practices	3
FOR 321 Drying and Machining of Wood	3	FOR 322 Wood Adhesives and Finishes	2
FOR 425 Chem. Aspects of Wood Utilization	3	FOR 323 Deterioration and Preservation of Wood	2
Statistics Requirement[5]	3	SPCH 250 Public Speaking	3
Study Area[6]	6	Study Area[6]	6
	18		16

SENIOR YEAR

FOR 422 Forest Products International Trade	3	FOR 419 Senior Problems	3
FOR 429 Wood Design	3	FOR 420 Forest Products	3
FOR 430 Composite Wood Materials	3	Humanities Requirement[4]	3
Study Area[6]	6	Study Area[6]	6
Elective	3	Elective	3
	18		18

144 Total Semester Hours

[1]CH 101/102 may be substituted.

[2]A student with a SAT Mathematics Achievement Test, Level II score of 550 or greater may take MTHSC 106 to satisfy the Mathematics Requirement; otherwise, MTHSC 102 and 207 are required. Two additional hours may be used as electives.

[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.

[4]See General Education Requirements.

[5]EX ST 301, MTHSC 203, 301.

[6]Study Areas are Wood Science and Technology, Forest Products Manufacturing Management, and Forest Products Marketing. Select one of these in consultation with adviser.

FOREST RESOURCE MANAGEMENT

The Forest Resource Management curriculum combines a broad education in the arts and sciences with applied forest sciences. This combination provides the necessary foundation for the scientific management of forest resources, products, and services.

Because of the nature of their education, foresters are qualified for a broad spectrum of employment opportunities in both the public and private sectors. They may be engaged as managers, administrators, or owners of forest lands or forest-based businesses; as technical specialists in the production of timber, useable water, wildlife, and esthetic values, and in the recreational use of the forest; or as professionals in other areas where the conservation of our natural resources is a matter of concern. Foresters earning advanced degrees find employment in academic work and in research conducted both by public and private agencies.

The undergraduate curriculum provides a strong program in the basic knowledge and skills required of a professional forester. Forest Resources Management majors will select a minor study area. (See minors listed in the Programs and Degrees section). The curriculum is also designed to provide the necessary prerequisites for those students who desire to continue in

graduate study. The Department of Forestry offers graduate programs that lead to the Master of Science, Master of Forest Resources, and Doctor of Philosophy degrees.

The Forest Resource Management curriculum is accredited by the Society of American Foresters.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II[2]	4
CH 105 Beginning and General Organic Chemistry[1]	4	CP SC 120 Introduction to Inform. Processing Sys.	3
ENGL 101 Composition I	3	ENGL 102 Composition II	3
FOR 101 Introduction to Forestry	1	FOR 221 Wood Properties I	3
MTHSC 102 Introduction to Mathematical Analysis	3	Elective	3
	15		16

SOPHOMORE YEAR

AGRON 202 Soils	4	FOR 206 Forest Ecology	3
FOR 205 Dendrology	3	PHYS 200 Introductory Physics	4
Literature Requirement[3]	3	SPCH 250 Public Speaking	3
Social Science Requirement[4]	3	Economic Requirement[6]	3
Elective	3	Humanities Requirement[4]	3
	16		16

FORESTRY SUMMMER CAMP

FOR 251 Forest Communities	2
FOR 252 Forest Engineering	3
FOR 253 Forest Resource Measurements I	3
FOR 254 Forest Products	1
FOR 258 Introduction to Forest Pests	1
	10

JUNIOR YEAR

FOR 304 Forest Resource Economics	3	ENGL 314 Technical Writing	3
FOR 401 Silviculture I	3	FOR 302 Forest Resource Measurements II	3
FOR 413 Integrated Forest Pest Management	3	FOR 308 Aerial Photographs in Forestry	2
EX ST 301 Introductory Statistics[5]	3	FOR 402 Silviculture II	3
Elective	4	Minor[7]	6
	16		17

SENIOR YEAR

FOR 314 Harveting Forestry Products	4	FOR 406 Forest Watershed Management	2
FOR 416 Forest Policy and Administration	2	FOR 415 Forest Wildlife Management	3
FOR 417 Forest Resource Management and Regulation	3	FOR 423 Current Issues in Natural Resources	2
FOR 418 Forest Resource Valuation	2	FOR 425 Forest Resource Management Plans	3
Minor[7]	6	FOR 431 Recreation Resource Planning	2
	17	Minor[7]	3
			15

138 Total Semester Hours

[1]CH 101 may be substituted.
[2]Can be satisfied by CH 102 (if CH 101 is taken) or 106 (if CH 105 is taken).
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]See General Education Requirements.
[5]MTHSC 203, 301, or equivalent may be taken in lieu of EX ST 301.
[6]To be selected in consultation with adviser.
[7]To be selected by the end of the sophomore year.

PARKS, RECREATION, AND TOURISM MANAGEMENT

The curriculum in Parks, Recreation and Tourism Management prepares students for a variety of careers in public and private leisure-services. The undergraduate curriculum is designed to provide a broad exposure to the social, physical and biological sciences as well as to develop the professional knowledge and leadership skills required to manage and administer leisure service programs and resources.

Flexibility within the curriculum is achieved by permitting the student to select coursework from among four emphasis areas that include Community Leisure Services, Recreation Resource Management, Therapeutic Recreation, and Travel and Tourism. The latitude in selection permits accommodation of the individual student's interests and professional career objectives. Students may complete requirements for a minor appropriate to their emphasis area.

Graduate study leading to a Master of Parks, Recreation, and Tourism Management; Master of Science; and Doctor of Philosophy is offered.

The Parks, Recreation and Tourism Management program is accredited by the National Council on Accreditation of the National Recreation and Parks Association in conjunction with the Council on Postsecondary Accreditation and has received a commendation for Excellence from the South Carolina Commission on Higher Education.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I[1]	4	BIOL 104 General Biology II[1]	4
or GEOL 101 Physical Geology[1]	3	or GEOL 102 Historical Geology[1]	3
and GEOL 103 Physical Geology Lab. 1	1	and GEOL 104 Historical Geology Lab. 1	1
ENGL 101 Composition I	3	ENGL 102 Composition II	3
PRTM 101 Concepts of Leisure	3	PRTM 205 Program and Event Planning	3
PRTM 104 Recreation Services Delivery Systems	3	Applied Science Requirement[3]	3
Mathematics Requirement[2]	3	Mathematics Requirement[2]	3
	16		16

SOPHOMORE YEAR

PRTM 201 The Recreation/Leisure Environment	3	PRTM 207 Practicum II	1
PRTM 206 Practicum I	1	PRTM 308 Leadership and Group Processes in Recreation	3
PSYCH 201 Introduction to Psychology[4]	3	SPCH 250 Public Speaking	3
or SOC 201 Introduction to Sociology[4]	3	Emphasis Requirement[6]	3
Emphasis Requirement[6]	3	Humanities Requirement[2]	3
Literature Requirement[5]	3	Social Science Requirement[2]	3
Elective	3		
	16		16

JUNIOR YEAR

PRTM 321 Recreation Administration	3	PRTM 305 Safety and Risk Management	3
PRTM 404 Field Training I	1	PRTM 309 Behavioral Concepts	3
Emphasis Requirement[6]	9	Emphasis Requirement[6]	7
Elective	3	Elective	3
	16		16

SUMMER

PRTM 405 Field Training II 7

SENIOR YEAR

PRTM 409 Methds of Recreation Research I	3	PRTM 406 Senior Seminar	1
Emphasis Requirement[6]	10	PRTM 410 Methods of Recreation Research II	3
Elective	3	Emphasis Requirement[6]	9
	16	Elective	3
			16

135 Total Semester Hours

[1]The student must complete an 8-hour sequence in the same science. Therapeutic Recreation students must take the general biology sequence.

[2]See General Education Requirements.

[3]Therapeutic Recreation emphasis students must take PRTM 203. All others may take PRTM 203 or any other applied science from the list in the General Education Requirements.

[4]Therapeutic Recreation emphasis students must take PSYCH 201 and SOC 201.

[5]ENGL 202, 203, 204, 205, 206, 207, 208, 209.

[6]See adviser for Emphasis Requirements lists that specify courses to be taken this semester. The actual credits may vary, depending on the courses selected.

Note: Emphasis requirement to be selected from Community Leisure Services, Recreation Resources Management, Therapeutic Recreation, or Travel and Tourism.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts, in addition to its eight majors leading to the degree of Bachelor of Arts and graduate degree programs in English, History, Applied Psychology, Applied Sociology, Professional Communication, and Public Administration, also contributes nearly all the instruction at the University in the humanities and social sciences. Unique among the College's eight departments is the Department of Performing Arts, which, although it offers no major curricula, provides in-depth instruction in the disciplines of music, speech, and theatre. The Department of Performing Arts also sponsors a variety of student activities, including programs in instrumental music, choral music, theatre, and debate.

BACHELOR OF ARTS CURRICULUM

The curriculum leading to the degree of Bachelor of Arts is designed to meet the needs of students who desire a broad general education, with emphasis upon the humanities and the social sciences, as a preparation for intelligent citizenship, for general commercial and industrial life, for government service, and for teaching. This curriculum also provides excellent background for the study of law, journalism, and medicine.

As soon as feasible and not later than the end of the sophomore year, the student seeking the Bachelor of Arts degree will select a major and a minor field of concentration from the following areas (or a double major from the list of possible majors)[1]:

Majors

English
History
Language and International Trade[1]
Modern Languages
Philosophy
Political Science
Psychology
Sociology

Minors[2]

Accounting
Biochemistry
Biological Sciences
Chemistry
Cluster Minor
Communications
Computer Science
Economics
English
Environmental Science
Fine Arts
Forest Products
Forest Resource Management
Geography
Geology
History
International Politics
Marketing
Mathematical Sciences
Microbiology
Modern Languages
Music
Philosophy
Physics
Political Science
Psychology
Religion
Science and Technology in Society
Sociology
Spanish-American Area Studies
Speech
Theatre
Women's Studies
Writing

To achieve depth as well as breadth in his/her educational experience, a student selects a major concentration consisting of at least 24 semester hours from courses above the sophomore level. A student also chooses a minor concentration consisting of at least 15 additional semester hours. Courses satisfying the student's major concentration may not also be included in the mi-

[1]The Language and International Trade major does not require a minor and may not be used in the double major program.
[2]See pages 60-65 for a description of course requirements for minors.

nor. The minor field of study may be selected from the approved list of minors within the College of Liberal Arts and of minors outside the College. A second major concentration (a double major) may substitute for the minor, provided all requirements are fulfilled for each major. This applies equally to a second major in a BA field outside the College of Liberal Arts, such as in the Colleges of Architecture, Commerce and Industry, Education, and Sciences.

The total number of semester credits required for the degree is 130, except for Language and International Trade, which requires 133. Of these, at least 12 credits must be earned in humanities courses numbered 300 or higher (MUSIC 210 and THEA 210 excepted) and at least 12 credits in social science courses numbered 300 or higher. The humanities are for this purpose considered to include art and architectural history, English (except 304, 312, 314, 316, 331, 333, 334, 335, 485, 490, 495), languages, music, philosophy, religion, speech (except 362 and 364), theatre (except 377, 387, and 397), and women's studies, as well as courses entitled humanities; the social sciences are here considered to include agricultural and applied economics, anthropology, economics, geography, history, political science, psychology, and sociology.

Students in the Bachelor of Arts program who expect to teach in the public schools may elect education courses required for teaching certificates by the South Carolina State Department of Education. Such courses are to be approved by their own department advisers.

BASIC CURRICULUM

FRESHMAN YEAR

First Semester		Second Semester	
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 101 Finite Probability[1]	3	MTHSC 102 Intro. to Math. Analysis[1]	3
Foreign Language	4	Same Foreign Language	4
Physical or Biological Science Requirement[2]	4	Physical or Biological Science Requirement[2]	4
	17		17

SOPHOMORE YEAR

Same Foreign Language	3	Same Foreign Language	3
Literature Requirement[3]	3	Literature Requirement[3]	3
Elective	12	Elective	10
	18		16

JUNIOR YEAR

Composition and Speaking Skills[4]	3	Applied Science Requirement[4]	3
Major and Minor Areas	9	Major and Minor Areas	12
Elective	3		15
	15		

SENIOR YEAR

Major and Minor Areas	9	Major and Minor Areas	9
Elective	8	Elective	6
	17		15

130 Total Semester Hours

[1]Students may pursue alternate sequences such as the following: MTHSC 101 and 106 or 203; 102 and 207; or 106 and 108, 207, 210, 301, 308. Sociology majors must take either MTHSC 101 and 203 or 106 and 301.

[2]A two-semester sequence of the same physical or biological science (astronomy, biology, chemistry, geology, or physics) totaling at least 8 semester credits, including the appropriate laboratory course.

[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.

[4]See General Education Requirements.

MAJOR CURRICULA IN THE COLLEGE OF LIBERAL ARTS

ENGLISH

The purposes of a major in English are to help students acquire an understanding of our literary heritage; develop an appreciation and practical knowledge of the modes of literary expression, research, and criticism; improve their ability to write effectively and intelligently; gain insights into literature as a humane study; and prepare for advanced work in English language, literature, and related disciplines.

The program of study for a major concentration in English consists of courses stipulated in the basic curriculum[1] for the Bachelor of Arts and 25 semester credits of English, arranged as follows:

Group I	ENGL 190 and 411.
Group II	Three credits from ENGL 405, 407, 408, 409, 410, 412, 413, 414.
Group III	Three credits from ENGL 406, 415, 416, 417, 418.
Group IV	Three credits from ENGL 422, 423, 424, 425.
Group V	Three credits from ENGL 300, 400, 401, 435, 491, 492.
Group VI	Nine additional credits from 300- and 400-level courses, at least 6 credits from the 400 level.[2]

The department requires proficiency in composition for all of its majors and minors. English majors or minors with writing problems must overcome them in the Writing Laboratory.

English majors must complete one of the following sequences of courses: HIST 361, 363; 316, 361; 316, 363; or 316, 365.

English majors must also fulfill a requirement in philosophy or religious studies by completing one of the following courses: PHIL 101, 102, 103, REL 101.

English majors must fulfill a fine arts requirement by completing one of the following courses: A A H 101, 210, ENGL 357, HUM 301, 302, 306, MUSIC 210, 311, 315, 316, THEA 210.

Electives are added as necessary to meet the minimum number of 130 credits for graduation.

[1]The Department suggests that English majors take ENGL 203 and 204 or 207 and 208 to satisfy the sophomore literature requirement.
[2]No course may be used toward the satisfaction of both major and minor requirements.

DEPARTMENTAL OFFERINGS

Because the English Department houses disciplines and courses often given separate departmental and course identity elsewhere, the following list of offerings will indicate the range and types of subjects bearing an English number in this catalog and in schedule booklets.

To find descriptions for all of the courses listed below, turn to page 244.

Freshman English ENGL 100, 101, H101, 102, H102.

Sophomore Literature ENGL 202, H202, 203, H203, 204, H204, 205, H205, 206, H206, 207, 208, 209.

Literature ENGL 353, 356, 385, 386, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 422, 423, 424, 425, 426, 430, 431, 432, 435, 436, 437, 455.

Advanced Writing ENGL 304, 312, 314, 345, 346, 445, 446, 485, 490, 495, THEA (ENGL) 347, 447.
Film ENGL 357, 358, 450, 451, 452, 453.
Linguistics ENGL 111, 217, 300, 400, 401.
Journalism ENGL 231, 331, 333, 334, 335.
Special Topics ENGL 350, 351, 355, 357.

HISTORY

The recommended program of study consists of the required courses in the Bachelor of Arts curriculum and 30 additional credits in history, including at least two courses at the 400 level, selected with the advice and consent of a departmental adviser and arranged to suit the academic interests of the student. Additional electives are added as needed to meet the minimum of 130 semester credits required for graduation.

Prelaw students majoring in History should consult the departmental adviser for prelaw for a recommended program.

LANGUAGE AND INTERNATIONAL TRADE

The purpose of the Language and International Trade program is to help students acquire a basic use of the four language skills (listening, reading, speaking, and writing); a familiarity with specific peoples, cultures, literatures and business environments; and the knowledge and skills to pursue graduate studies or careers in business.

The Bachelor of Arts degree program in Language and International Trade, combines foreign languages and international trade. Students choose one language (French, German, or Spanish) and one professional option: Applied International Economics, Forest Products, International Trade, Textiles, or Tourism.

A summer internship between the junior and senior years gives students the opportunity to apply classroom learning to a business/industrial work environment. Language and International Trade majors are also encouraged to participate in Study Abroad programs in order to increase their language proficiency.

Students should confer with the Language and International Trade director for specific course requirements involving the various language options and the chosen professional concentration.

The 133 semester-hour curriculum, which includes at least 24 hours at the 300-400 level in the language track and also in the professional concentration, is outlined below.

The language component emphasizes speaking and writing skills, culture, civilization, and business/technical languages. Students are required to take the courses listed under one of the following languages:
French 102, 201, 202, 305, 307 or 308, 316, 411, 416, plus 9 credits of French courses at the 300-400 level as specified on the departmental advising sheets; L&IT 127; and L&IT 400, 401, or 402.
German 102, 201, 202 or 251, 305, 308 or 309 or 413, 316, 411, 416, plus 9 credits of German courses at the 300-400 level as specified on the departmental advising sheets; L&IT 127; and L&IT 400, 401, or 402.
Spanish 102, 201, 202, 305, 307 or 308 or 435, 316, 411, 416, plus 9 credits of Spanish courses at the 300-400 level as specified on the departmental advis-

ing sheets; L&IT 127; and L&IT 400, 401, or 402.

The professional component emphasizes international marketing in areas important to the economy of the state and the nation. Students are required to take the courses listed under one of the following professional options:

Applied International Economics ACCT 203, AGRIC 301, 401, AP EC 202, 409, 420, ECON 212, 310 or 412, ENGL 316, EX ST 462, MGT 423, MKT 301, 427.

Forest Products ECON 211, 310 or 412, ENGL 316, FOR 311, 324, 419, 420, 422, MKT 301, 427.

International Trade ACCT 203, ECON 211, 310 or 412, ENGL 316, FIN 306, LAW 322, MGT 301, 418, 424, MKT 301, 427, MTHSC 301.

Textiles ECON 211, 310 or 412, ENGL 316, MKT 301, 423, 427, TEXT 308, 314, 322, 460, 472.

Tourism ECON 211, 310 or 412, ENGL 316, MKT 301, 423, 427, PRTM 342, 343, 444, 447, plus 3 additional credits in parks, recreation, and tourism management at the 300-400 level, approved by the Language and International Trade director, preferably PRTM 401 or 441 or 443.

Department requirements for all options include 3 credits from art and architectural history, music, or theater (practica with approval of department head).

In addition, students will be required, as a condition of graduation, to pass a noncredit examination to determine their language competency. The examination will be taken in the student's last full semester at the University.

MODERN LANGUAGES

The purpose of the Bachelor of Arts degree in Modern Languages is to help students acquire a basic use of the four language skills (listening, reading, speaking, and writing); a familiarity with specific peoples, cultures and literatures; and the knowledge and foreign-language skills to pursue graduate studies or careers in education or business.

A student may elect a major concentration in a single language, a double major in two languages, or a double major combining a language major with a Bachelor of Arts major outside the department. All Modern Language majors will choose one of the following options:

Option A Designed to prepare the student to continue education in graduate school or to provide background for other professional language careers.

Option B Designed to prepare for teaching in secondary schools, Option B requires the courses specified below plus coursework in education to meet certification requirements.

Option C Option C is designed to prepare the student for a career in business. Modern Language majors seeking employment with multinational firms in the United States and overseas, or pursuing graduate degrees in international business studies, economics, or agricultural economics may have one of the following:

a) A double major with Economics.
b) A Cluster minor in Administration.
c) A minor in Accounting or Spanish-American Area Studies.

Option D Option D is designed to permit students to obtain a double major by combining either French, German or Spanish with any other major in the

College of Liberal Arts or with any Bachelor of Arts degree program in the University. All requirements for each major must be fulfilled.

All Modern Language majors must complete the stipulated courses in the basic Bachelor of Arts curriculum.

French All options require FR 205 and 309 plus 24 additional credits in French at the 300-400 level appropriate to the option and approved by the head of the department. Option A requires 6 credits of 400-level literature courses, and Options B and C require 6 credits in literature courses, of which 3 credits must be at the 400 level.

German All options require 24 credits in German at the 300-400 level appropriate to the option and approved by the head of the department.

Spanish All options require 30 credits at the 300-400 levels, of which 9 hours must be at the 400 level. A minimum of 6 hours of literature, including one course at the 400 level, is also required.

Department requirements for all options: 3 credits from art and architectural history, music, or theatre (practica with approval of department head).

In addition, students will be required, as a condition of graduation, to pass a noncredit examination to determine their language competency. The examination will be taken in the student's last full semester at the University.

PHILOSOPHY

The recommended course of study will consist of the Bachelor of Arts curriculum, one philosophy course at the 100 level (PHIL 101, 102 or 103), both PHIL 315 and 316, and 24 additional credits in philosophy courses numbered 300 or higher, including at least one 3-credit course at the 400 level, selected with the advice and consent of a departmental adviser and arranged to suit the academic interests of the student. Additional electives are added as needed to meet the minimum of 130 semester credits required for graduation.

POLITICAL SCIENCE

The requirements for a major in Political Science consist of the required PO SC 101, 103 or 105, 341; plus at least 21 additional semester hours of political science at the 300 or 400 level, including at least one course from four of the following five fields:

American Government PO SC 403, 405, 432, 442.
Comparative Politics PO SC 371, 373, 471, 475, 476, 477.
International Relations PO SC 361, 428, 462, 463, 465.
Political Theory PO SC 351, 352, 453.
Public Policy and Public Administration PO SC 302, 321, 422.

The student's elective hours in political science are chosen with the consent and advice of the departmental adviser to ensure an appropriate balance of breadth and specialization within the field of political science. In addition to the courses listed above, the department offers a wide range of specialized courses in each of the subfields of the political science discipline, including:

American Government PO SC 408, 409, 433, 434, 435, 443, 448, 454.
International Relations/Comparative Politics PO SC 379, 468, 472, 476.
Public Policy and Public Administration PO SC 423, 425, 426, 427.

Other Courses PO SC 310, 311, 312, 457, 482.

Note: No more than 3 hours credit from PO SC 310, 311, or 312 may be applied to the requirements for a Political Science major.

PSYCHOLOGY

The requirements for the major in Psychology consist of the required courses in the Bachelor of Arts curriculum; PSYCH 201, 210, 310, 324, 333, 352, and 15 additional credits in psychology at the 300-or 400 level. These 15 credits must include at least 6 credits at the 400 level and at least one laboratory course (PSYCH 321, 325, 334, 423). ZOOL 470 may be taken in lieu of one 300- or 400-level elective psychology course.

It is recommended that Psychology majors take MTHSC 101 and 203, or MTHSC 102 and 207. Students should consult their academic advisers for additional course recommendations.

SOCIOLOGY

The Sociology major consists of the required courses in the Bachelor of Arts curriculum (Sociology majors must take MTHSC 101 and 203 or 106 and 301), SOC 201, 404, either 460 or 461, SOC (R S) 303, and 21 credits from one of the following concentrations:

General Sociology One course from each of the following pairs: SOC 311 or 432, 330 or 331, 350 or 351; and 12 credits from among all courses offered in sociology or anthropology not already taken to fulfill requirements.

Social Services Sociology SOC 380, SOC (R S) 495, one course from among SOC 392, 394, 395, 480, 481; and 9 credits from among all courses offered in sociology and anthropology not already taken to fulfill requirements, including PSYCH 488.

Criminal Justice Sociology SOC 390, either 392 or 393, one course from among SOC 391, 395, HIST 496, PO SC 434, 435; and 12 credits from among all courses offered in sociology and anthropology not already taken to fulfill requirements. SOC (R S) 495 is recommended.

Community and Population Studies—Offered jointly with Rural Sociology (A) Twelve hours from among C R P 411, SOC (R S) 359, 371, 401, 471; (B) Nine hours from among C R P 415, 472, 473, C R D 357, C R D (AP EC) 411, 412, MTHSC 301, SOC 330, 331, 430, SOC (R S) 403, and the one three-hour course not used to satisfy requirement A above. (R S 301 may be substituted for SOC 201 by Community and Rural Development majors.)

At least 9 of the total credits in the major must be 400-level sociology and/or rural sociology courses: no more than 9 credit hours may be taken in courses at the 100- or 200-level, except by the approval of the department head. Additional electives are added as needed to meet the minimum of 130 credits required for graduation.

COURSES NOT APPROVED FOR GRADUATION CREDIT IN THE COLLEGE OF LIBERAL ARTS

Students majoring in the College of Liberal Arts are not permitted to use ENGL 100, MTHSC 115, 116, 215, 216 as credit toward the number of credits needed for graduation.

COLLEGE OF NURSING

Clemson University College of Nursing provides baccalaureate and master's degree programs to prepare for careers in nursing. A baccalaureate degree in Health Science is available. Opportunities within the College of Nursing and elsewhere in the University combine to provide a setting which enables students to fulfill a wide range of educational objectives. Each student enrolled in nursing is encouraged to recognize these opportunities and partake of them.

NURSING

The Department of Nursing Science offers a four-year program leading to the Bachelor of Science with a major in Nursing which is designed to prepare students for the practice of professional nursing in a variety of settings, such as hospitals, industry, clinics, and public health agencies. This curriculum provides an unlimited opportunity for men and women to attain sound preparation for professional nursing and a foundation for graduate study in nursing. During the first two years, emphasis is upon liberal arts and basic science courses arranged sequentially to provide a foundation for the nursing major. In junior and senior years the emphasis is upon the study of nursing. However, throughout the entire program, students are encouraged to enroll in courses outside their majors which can be taken simultaneously with the study of nursing. Nursing courses are integrated through all years of the curriculum. Clinical nursing experiences, under the guidance of the College of Nursing faculty, take place with clients in multiple hospitals, clinics, and other health agencies. These community resources enable students of nursing to enjoy a variety of clinical facilities and assist faculty to provide quality clinical instruction. Students are responsible for their own transportation to all off-campus clinical laboratory experiences.

The RN/BS/MS curriculum offers an individualized study option for registered nurses who desire advanced education in nursing. Credits may be earned through an accelerated program of study, combining transfer credits for selected courses from any accredited institution of higher learning, credit by examination for previously completed nursing courses, and enrollment in courses at Clemson University.

ENTRANCE REQUIREMENTS

To facilitate admission of students who can achieve at an appropriate level in the program, admission is selective. Consideration is given to performance in secondary school and on the College Board Examination (SAT). Those seeking admission are advised to apply to the University early in the fall of the senior year in high school.

OTHER REQUIREMENTS

All students enrolled in the Nursing major are required to carry throughout the period of clinical laboratory assignments a current and valid student nurse's professional liability insurance policy with minimum limits of liability of $1,000,000 per occurrence and $3,000,000 in aggregate and provide documentation thereof to the Dean of the College of Nursing. No student may participate in clinical learning activities without this insurance coverage.

To comply with clinical agency contract requirements and to meet State of South Carolina law, students enrolled in nursing courses with a clinical laboratory must meet specific requirements before participating in clinical experiences. These requirements are listed in the *Department of Nursing Science Student Handbook.*

POLICY ON ELECTIVES FOR THE BACHELOR OF SCIENCE WITH A MAJOR IN NURSING

Class advisers must approve any course taken for elective credit in the Bachelor of Science in Nursing curriculum.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 101 Finite Probability	3
PSYCH 201 Introduction to Psychology	3	NUTR 203 Principles of Human Nutrition	3
SOC 201 Introduction to Sociology	3	Chemistry Requirement[1]	4
Chemistry Requirement[1]	4	Computer Technology Requirement[3]	3
	17		16

SOPHOMORE YEAR

BIOSC 222 Human Anatomy and Physiology I	4	BIOSC 223 Human Anatomy and Physiology II	4
EX ST 301 Introductory Statistics	3	NURS 211 Therapeutic Nursing Interventions	4
or MTHSC 203 Elem. Stat. Inference	3	NURS 240 Pharmacotherapeutic Nursing Interventions	3
MICRO 205 Introductory Microbiology	4	PSYCH 340 Life Span Development Psychology	3
NURS 210 Health Assessment	3	SOC 311 The Family	3
NURS 230 Professionalism in Nursing I	3		17
	17		

JUNIOR YEAR

NURS 301 Nursing Care of the Childbearing Family	4	NURS 303 Nursing of Adults	7
NURS 302 Nursing Care of Children	4	NURS 316 Adult Nursing in the Community	4
NURS 304 Pathophysiology for Health Care Professionals[4]	3	NURS 330 Research in Nursing	2
NURS 315 The Developing Family in the Community	4	Humanities Requirement[2]	3
Literature Requirement[2]	3		16
	18		

SENIOR YEAR

NURS 401 Mental Health Nursing	4	NURS 403 Complex Nursing of Adults	6
NURS 402 Long-Term Nursing Care	3	NURS 404 Nursing Management	3
NURS 415 Community Health Nursing	3	NURS 430 Nursing Leadership and Health Policy	2
Communication Skills Requirement[2]	3	Elective	6
Elective	4		17
	17		

135 Total Semester Hours

[1]Select from CH 105 and 106 or 101 and 102/112. (See adviser.)
[2]See General Education Requirements.
[3]Must be approved by adviser.
[4]NURS 304 to be taken with the junior year first semester nursing courses.
Notes:
1. A minimum of C is required in the following science courses for progression to junior year clinical courses: BIOL 103, MICRO 205, BIOSC 222, 223, and the Chemistry Requirement.
2. A minimum of C must be achieved in all required nursing courses for progression to the next level. Students may repeat a nursing course one time only.
3. A minimum grade-point ratio of 2.0 is required for registration in each clinical nursing courses.

HEALTH SCIENCE

The Health Science undergraduate degree program is designed to prepare students for careers which promote health in a variety of settings and with various populations. The curriculum for the Bachelor of Science with a major in Health Science consists of four core strands. The first provides students with content and experience in health and wellness across the life span. The second strand provides the content, application, and evaluation

skills needed to be successful in the field of health education and promotion. Strategies for health behaviors are the third strand. Communication techniques and research strategies compose the fourth.

The major objectives of the degree program are implementing healthy lifestyle programs such as parenting, sexuality and reproduction education, nutrition programs, wellness and life-style programs and family development; coordinating health programs such as child care after-school programs, decision-making and life choices for teenagers, wellness programs and risk-factor modification for adults, and elder day-care and retirement activity programs; providing prevention and intervention programs such as blood pressure management, stress workshops, smoking cessation, weight management, self-care programs, fitness/exercise programs, substance abuse, and occupational safety.

Inherent in these broad objectives are basic health assessment skills necessary to determine health parameters; and planning, management, and evaluation skills essential to health program development and coordination. The typical curriculum plan for the degree program is presented below. Preprofessional health studies students may major in health science as footnoted on the curriculum plan.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 103 General Biology I[5]	4	ENGL 102 Composition II	3
ENGL 101 Composition I	3	HLTH 103 Communication Principles	1
HLTH 101 Introduction to Health Careers[5]	1	PSYCH 201 Introduction to Psychology	3
Chemistry Requirement[1,5]	4	SOC 201 Introduction to Sociology	3
Computer Technology Requirement[3]	3	Chemistry Requirement[1,5]	4
	15	Mathematical Science Requirement[2,5]	3
			17

SOPHOMORE YEAR

BIOSC 222 Human Anatomy and Physiology I	4	BIOSC 223 Human Anatomy and Physiology II	4
ED 234 Introduction to Addictions[5]	3	HLTH 240 Deterimants of Health Behavior	3
EN SC 200 Introduction to Environmental Science	3	Developmental Psychology Requirement[3]	3
HLTH 202 Trends in Health Promotion	3	Nutrition Requirement[3]	3
HLTH 298 Health Maintenance	3	Public Speaking Requirement[2]	3
HLTH 299 Health Maintenance Appraisal	1		16
	17		

JUNIOR YEAR

HLTH 303 Communication in Health Systems	3	HLTH 310 Women's Health Issues	3
HLTH 305 Body Response to Health Behaviors	3	HLTH 320 Health Maintenance of Men	3
HLTH 380 Epidemiology	3	HLTH 340 Health Promotion and Education	3
SOC 311 The Family	3	Health Requirement[5]	3
or ANTH 301 Cultural Anthropology	3	Humanities Requirement[2]	3
Mathematical Science Requirement (Statistics)[4]	3	Elective	3
Elective	3		18
	18		

SENIOR YEAR

HLTH 401 Health Consumerism[5]	3	HLTH 402 Health Emergencies[5]	3
HLTH 410 Concepts of Health for Children	3	HLTH 430 Health Promotion of the Aged	3
HLTH 480 Community Health Promotion	3	HLTH 440 Leadership in Health Promotion	3
HLTH 498 Contemporary Health Problems	3	HLTH 450 Applied Health Strategies	3
Literature Requirement[2]	3	HLTH 490 Research in Health	3
Elective	3	Elective	1
	18		16

135 Total Semester Hours

[1]CH 101, 102 or 101, 112 or 105, 106.
[2]See General Education Requirements.
[3]See adviser.
[4]EX ST 301, MTHSC 203, 301.
[5]Preprofessional Health students may substitute additional science requirements: BIOL 103, 104 or BIOL 110, 111; 8 credits of physics; 8 credits of organic chemistry. CH 101, 112 and MTHSC 106 are also required. (See Health Science adviser.)

COLLEGE OF SCIENCES

The College of Sciences, attuned to the times and its needs, offers ten major curricula leading to the degree of Bachelor of Science. These are Biochemistry, Biological Sciences, Chemistry, Computer Information Systems, Computer Science, Geology, Mathematical Sciences, Medical Technology, Microbiology, and Physics.

In addition, the Bachelor of Arts degree is offered with a major emphasis in Biological Sciences, Chemistry, Computer Science, Geology, Mathematical Sciences, and Physics.

Not only are the departments in the College of Sciences concerned with their own programs, but they work closely with the other academic departments in the University. This interweaving of the physical, mathematical, and biological sciences with other disciplines, such as economics, engineering, management and others allows students great flexibility and responsibility in designing their own programs.

BACHELOR OF ARTS CURRICULA

The curricula leading to the Bachelor of Arts degree are designed to meet the needs of those students who desire a broad general education. The first two years are spent in introductory work in several areas in order to give the student breadth of view. This background enables the student to select intelligently the major and minor fields of concentration. The major areas in the College of Sciences are Biological Sciences, Chemistry, Computer Science, Geology, Mathematical Sciences, and Physics.

A student has a large degree of flexibility and responsibility in designing the minor area from any departments in the University. All undergraduate degree programs and minors are listed in the tables with the descriptions following on pages 60-65. The courses for these minors are to be selected in consultation with the appropriate department.

To fulfill requirements for a major concentration, a student takes 24 semester hours credit from courses above the sophomore level including or in addition to certain courses specified by the major department; the minor concentration requires 15 credits from courses above the sophomore level. In some major and minor disciplines, certain prescribed courses at the sophomore level are counted toward the 24 and 15 credit-hour requirements.

MAJOR FIELDS OF CONCENTRATION

BIOLOGICAL SCIENCES

The Bachelor of Arts in Biological Sciences provides a strong foundation in biology and is ideal for students desiring a liberal education emphasizing an interdisciplinary approach to a thorough understanding of the life sciences.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I[1]	5	BIOL 111 Principles of Biology II[1]	5
CH 101 General Chemistry	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
Foreign Language Requirement[2]	4	Foreign Language Requirement[2]	4
	16		16

Note: No curriculum in the College of Sciences leading to the Bachelor of Arts or Bachelor of Science degree will allow credit for AG ED 101, ENGL 100, MTHSC 104 or 105 to be used to satisfy requirements for graduation.

SOPHOMORE YEAR

BIOSC 304 Biology of Plant[3]	4
or BIOSC 305 Algae and Fungi	4
HIST 172 Western Civilization	3
MTHSC 106 Calculus of One Variable I	4
Foreign Language Requirement[2]	3
Literature Requirement[4]	3
	17

BIOSC 302 Invertebrate Biology[3]	4
or BIOSC 303 Vertebrate Biology	4
HIST 173 Western Civilization	3
MTHSC 108 Calculus of One Variable II	4
or MTHSC 301 Stat. Theory and Meth. I	3
Foreign Language Requirement[2]	3
Literature Requirement[4]	3
	16-17

JUNIOR YEAR

BIOCH 210 Elementary Biochemistry	4
PHYS 207 General Physics I	4
Major[5]	4
Minor[6]	3
Elective	3
	18

ENGL 314 Technical Writing	3
or SPCH 250 Public Speaking	3
PHIL 325 Philosophy of Science	3
PHYS 208 General Physics II	4
Major[5]	4
Minor[6]	3
	17

SENIOR YEAR

Major[5]	4
Minor[6]	6
Elective	6
	16

Major[5]	4
Minor[6]	3
Elective	9
	16

132 Total Semester Hours

[1]BIOL 110 and 111 are strongly recommended. However, BIOL 103 may substitute for BIOL 110 and BIOL 104 may substitute for BIOL 111; the remaining 1-2 hours required must be satisfied by completing 1-2 extra hours in major elective courses.
[2]Four semesters of the same language are required.
[3]Eight credits from BIOSC 302, 303, 304, 305 count toward the required 24 hours of the Biological Sciences major.
[4]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[5]At least one course must be taken from each of 4 course areas: (1) Genetics and Evolution, (2) Ecology and Behavior, (3) Development and Cell Biology, and (4) Physiology.
[6]Minors may be arranged in consultation with a departmental adviser.

CHEMISTRY

For the Bachelor of Arts degree, Chemistry requires 130 semester hours.

FRESHMAN YEAR

First Semester	
CH 101 General Chemistry	4
CH 141 Chemistry Orientation	1
ENGL 101 Composition I	3
MTHSC 106 Calculus of One Variable I	4
Modern Language[4]	4
	16

Second Semester	
CH 112 General Chemistry[1]	4
ENGL 102 Composition II	3
MTHSC 108 Calculus of One Variable II	4
Modern Language[4]	4
	15

SOPHOMORE YEAR

CH 223 Organic Chemistry[3]	3
CH 225 Organic Chemistry Lab[3]	2
MTHSC 206 Cal. of Sev. Var	4
PHYS 122 Phys. with Cal. I	3
Literature Requirement[2]	3
Modern Language[4]	3
	18

CH 224 Organic Chemistry[3]	3
CH 226 Organic Chemistry Lab[3]	2
HIST 172 Western Civilization	3
PHYS 221 Phys. with Cal. II	3
Modern Language[4]	3
Elective	3
	17

JUNIOR YEAR

CH 313 Quantitative Analysis	3
CH 317 Quantitative Analysis Lab.	1
HIST 173 Western Civilization	3
Humanities Requirement	3
Minor	3
Elective	3
	16

CH 331 Physical Chemistry	3
ENGL 314 Technical Writing	3
or SPCH 250 Public Speaking	3
Minor	6
Elective	5
	17

SENIOR YEAR

CH 332 Physical Chemistry	3
Minor	3
Elective	9
	15

Chemistry Requirement	4
Minor	3
Elective	9
	16

130 Total Semester Hours

[1]Students are encouraged to add as an elective CH 205.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]CH 223, 224, 225, 226 will count toward the 24 hours of the Chemistry major.
[4]Four semesters of the same language.

COMPUTER SCIENCE

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 101 Computer Science I	4	CP SC 102 Computer Science II	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
Language Requirement[1]	4	Language Requirement[1]	4
	18		18

SOPHOMORE YEAR

CP SC 231 Computer Science III	4	CP SC 241 Computer Science IV	4
MTHSC 119 Intro. to Discrete Math	3	Language Requirement[1]	3
Language Requirement[1]	3	Literature Requirement[2]	3
Literature Requirement[2]	3	Natural Science[3]	4
Natural Science[3]	4	Elective	3
	17		17

JUNIOR YEAR

CP SC 360 Peripherals and File Design	3	CP SC 372 Intro. to Software Development	3
ENGL 314 Technical Writing	3	Computer Science Requirement[4]	3
or SPCH 250 Public Speaking	3	Minor	6
MTHSC 311 Linear Algebra	3	Elective	3
Computer Science Requirement[4]	3		15
Minor	3		
	15		

SENIOR YEAR

Computer Science Requirement[4]	6	Computer Science Requirement[4]	3
Fine Arts Requirement[5]	3	Minor	3
Minor	3	Elective	9
Restricted Elective[6]	3		15
	15		

130 Total Semester Hours

[1]Four semesters of the same language.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]Must be one of the following sequences: BIOL 103, 104; CH 101, 102 or 112; PHYS 122, 124, 221, 223; PHYS 207, 208.
[4]Must include at least 9 credit hours chosen from CP SC 350 and, 400-level computer science courses.
[5]Select from MUSIC 210, 311, Art History and Architectural History.
[6]Select from philosophy, anthropology (except 251), political science, HIST 198 (3 times), 300-level English Literature and 300-level Language Literature.

Notes:

1. For graduation, a candidate for the BA degree in Computer Science must have earned a grade of C or better in each computer science course applied to the degree.
2. Before enrolling in a computer science course, a grade of C or better must be earned in all prerequisite courses.

GEOLOGY

For the Bachelor of Arts degree, Geology requires 128 semester hours.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
GEOL 101 Physical Geology	3	GEOL 102 Historical Geology	3
GEOL 103 Physical Geology Lab	1	GEOL 104 Historical Geology Lab	1
MTHSC 102 Introduction to Math. Analysis	3	MTHSC 101 Finite Probability	3
or MTHSC 106 Calculus of One Var. I	4	or MTHSC 108 Calculus of One Var. II	4
	14-15	or MTHSC 207 Multivariable Calculus	3
		Elective	3
			17-18

SOPHOMORE YEAR

HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
Literature Requirement[1]	3	Humanities Requirement	3
Modern Language[2]	4	Modern Language[2]	4
Elective	6	Science Requirement[3]	3
	16	Elective	3
			16

JUNIOR YEAR

ENGL 314 Technical Writing	3	GEOL 309 Petrology	3
GEOL 306 Mineralogy	3	Geology Requirement[2]	3
Geology Requirement[4]	3	Minor	3
Minor	3	Modern Language[2]	3
Modern Language[2]	3	Elective	5
Elective	2		17
	17		

SENIOR YEAR

GEOL 402 Structural Geology	3	GEOL 404 Economic Geology	3
Geology Requirement[4]	3	Geology Requirement[4]	3
Minor	6	Minor	3
Elective	3	Elective	7
	15		16

128 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]Two years of the same language are required.
[3]Select from BIOL 103, CP SC 110, 120, EX ST 301, PHYS 122, 207.
[4]Select from any 300- or 400-level geology course not required in the curriculum.

MATHEMATICAL SCIENCES

For a major concentration a recommended program of study is shown below, with 130 semester hours required for graduation.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 200 Economic Concepts	3	CP SC 110 Elem. Comp. Programming	3
or ECON 211 Principles of Microeconomics	3	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
HIST 172 Western Civilization	3	MTHSC 129 Prob. Solving in Disc. Math	3
MTHSC 106 Calculus of One Variable I	4	Foreign Language[1]	4
Foreign Language[1]	4		17
	17		

SOPHOMORE YEAR

MTHSC 206 Cal. of Several Var	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
MTHSC 250 Intro. to Mathematical Sciences	1	MTHSC 311 Linear Algebra	3
Foreign Language[1]	3	Foreign Language[1]	3
Literature Requirement[2]	3	Literature Requirement[2]	3
Natural Science Requirement[3]	4	Natural Science Requirement[3]	4
	15		17

JUNIOR YEAR

A A H 210 Introduction to Art and Architecture	3	HIST 173 Western Civilization	3
or MUSIC 210 Music Appreciation	3	MTHSC 400 Theory of Probability	3
ENGL 314 Technical Writing	3	MTHSC 412 Introduction to Modern Algebra	3
or SPCH 250 Public Speaking	3	Minor	3
MTHSC 302 Statistics for Science and Engineering	3	Social Science Requirement[3]	3
Minor	3	Elective	2
Social Science Requirement[3]	3		17
Elective	2		
	17		

SENIOR YEAR

MTHSC 440 Linear Programming	3
or MTHSC 450 Introduction to Mathematical Models	3
MTHSC 453 Advanced Calculus I	3
or MTHSC 463 Mathematical Analysis I	3
Minor	6
Elective	3
	15

MTHSC 454 Advanced Calculus II	3
or MTHSC 464 Mathematical Analysis II	3
Humanities Requirement[3]	3
Mathematical Sciences Requirement[4]	3
Minor	3
Elective	3
	15

130 Total Semester Hours

[1]Four semesters of the same language.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]Must be approved by adviser.
[4]Select from 300- and 400-level mathematical science courses with approval of adviser.
Notes:
1. For graduation, a candidate for the BA degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point ratio in all required courses taught by the Mathematical Sciences Department including approved mathematical sciences electives and option courses.
2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next mathematical science course.

PHYSICS

For a major concentration a recommended program of study is shown below, with 130 semester hours required for graduation.

The BA in Physics program is ideal for students interested in acquiring a broad-based liberal education that includes a strong and solid understanding of science.

FRESHMAN YEAR

First Semester	
CH 101 General Chemistry	4
ENGL 101 Composition I	3
HIST 172 Western Civilization[1]	3
MTHSC 106 Calculus of One Variable I	4
PHYS 101 Current Topics in Modern Physics	1
	15

Second Semester	
CH 112 General Chemistry	4
ENGL 102 Composition II	3
HIST 173 Western Civilization[1]	3
MTHSC 108 Calculus of One Variable II	4
PHYS 122 Physics with Cal. I	3
PHYS 124 Physics Lab. I	1
	18

SOPHOMORE YEAR

MTHSC 206 Calculus of Several Variables	4
PHYS 221 Physics with Cal. II	3
PHYS 223 Physics Lab. II	1
Literature Requirement[2]	3
Modern Language[1]	4
Elective	2
	17

MTHSC 208 Intro. to Ord. Diff. Equa	4
PHYS 222 Physics with Cal. III	3
PHYS 224 Physics Lab. III	1
Literature Requirement[2]	3
Modern Language[1]	4
	15

JUNIOR YEAR

ENGL 314 Technical Writing	3
or SPCH 250 Public Speaking	3
PHYS 321 Mechanics I	3
PHYS 355 Modern Physics	3
Minor	3
Modern Language[1]	3
Elective	2
	17

PHYS 322 Mechanics II	3
PHYS 441 Electromagnetics I	3
Humanities Requirement[3]	3
Minor	3
Modern Language[1]	3
	15

SENIOR YEAR

PHYS 325 Experimental Physics I	3
Minor	6
Physics (as approved)	3
Social Science Requirement[3]	3
Elective	3
	18

Humanities Requirement[3]	3
Minor	3
Physics (as approved)	3
Social Science Requirement[3]	3
Elective	3
	15

130 Total Semester Hours

[1]Modern Language may be taken before history.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]See General Education Requirements.

BACHELOR OF SCIENCE CURRICULA

BIOCHEMISTRY

Biochemistry is the study of the molecular basis of life. In order to comprehend current biochemical information and to make future contributions to our molecular understanding of life processes, the student must obtain a broad background in biology and a firm foundation in chemistry, mathematics, and physics; the biochemistry curriculum is built upon this concept.

The program provides an excellent educational background for professional school (e.g., medicine, dentistry, or veterinary medicine) and graduate school in biochemistry, molecular biology, or another biological science discipline.

The graduate will find employment opportunities in the research and service programs of universities, medical schools, hospitals, research institutes, and industrial and government laboratories.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I	5	BIOL 111 Principles of Biology II	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
	16		16

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	BIOCH 301 General Biochemistry	3
CH 227 Organic Chemistry Lab.[1]	1	CH 224 Organic Chemistry	3
MICRO 305 General Microbiology	4	CH 228 Organic Chemistry Lab.[1]	1
MTHSC 206 Calculus of Several Variables	4	PHYS 221 Physics with Calculus II	3
PHYS 122 Physics with Calculus I	3	PHYS 223 Physics Lab. II	1
PHYS 124 Physics Lab. I	1	Literature Requirement[2]	3
	16	Social Science Requirement	3
			17

JUNIOR YEAR

BIOCH 431 Phys. Approach to Biochemistry	3	BIOCH 432 Biochemistry of Metabolism	3
BIOCH 433 General Biochemistry Lab. I	2	BIOCH 434 General Biochemistry Lab. II	2
CH 330 Introduction to Physical Chemistry[3]	3	Approved Requirement[4]	3
Approved Requirement[4]	3	Literature Requirement[2]	3
Science Requirement[5]	3	Science Requirement[5]	4
Elective	3	Social Science Requirement	3
	17		18

SENIOR YEAR

BIOCH 491 Special Problems in Biochemistry	3	BIOSC 493 Senior Seminar	2
CH 313 Quantitative Analysis	3	Approved Requirement[4]	6
CH 317 Quantitative Analysis Lab	1	Science Requirement[5]	3
ENGL 314 Technical Writing	3	Elective	7
or SPCH 250 Public Speaking	3		18
Approved Requirement[4]	6		
	16		

134 Total Semester Hours

[1]CH 225 may be substituted for CH 227, and CH 226 may substitute for CH 228. In both cases, the additional hour of credit counts toward a science elective.

[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.

[3]CH 331 can be substituted.

[4]At least 12 hours must be selected from the humanities and/or social sciences (Sections D2 and E1 of the General Education Requirements). A one-year sequence from the following is strongly recommended: FR 101/102, GER 101/102, RUSS 101/102.

[5]Science Requirement can be selected from biological sciences, botany, chemistry, computer science, genetics, mathematics, microbiology, physics, plant pathology, zoology, or as approved by the adviser in consultation with the biochemistry faculty.

BIOLOGICAL SCIENCES

Biology encompasses the broad spectrum of the modern life sciences, including the study of all aspects of life from the structure and function of the whole organism down to the subcellular levels and up through the interactions of organisms to the integrated existence of life on the entire planet. Descriptive, structural, functional, and evolutionary questions are explored through the hierarchy of the organization of life. Applications of current advances to the health and well-being of man and his society, to nature and the continuation of earth as a balanced ecosystem, and to an appreciation of the place of natural science in our cultural heritage receive emphasis.

Majors in Biological Sciences receive classroom, laboratory, and field training in biology with an emphasis on chemistry, mathematics, and physics as necessary tools. The Bachelor of Science in Biological Sciences curriculum prepares students for graduate study in any of the life science areas (such as agricultural sciences, biochemistry, botany, cell and molecular biology, conservation, ecology and environmental science, entomology, forestry, genetics, industrial and regulatory biology, microbiology, morphology, physiology, wildlife biology, and zoology, among others), for the health professions (medicine, dentistry, etc.), veterinary medicine, and for science teaching.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I[1]	5	BIOL 111 Principles of Biology II[1]	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
	16		16

SOPHOMORE YEAR

BIOSC 304 Biology of Plants	4	BIOSC 302 Invertebrate Biology	4
or BIOSC 305 Algae and Fungi	4	or BIOSC 303 Vertebrate Biology	4
CH 223 Organic Chemistry	3	CH 224 Organic Chemistry[4]	3
CH 227 Organic Chemistry Lab	1	PHIL 325 Philosophy of Science	3
Approved Requirement[3]	3	Approved Requirement[3]	3
Literature Requirement[2]	3	Social Science Requirement[5]	3
Elective	3		16
	17		

JUNIOR YEAR

BIOCH 301 General Biochemistry	3	ENGL 314 Technical Writing	3
BIOCH 302 Molecular Biology Lab.[4]	1	or SPCH 250 Public Speaking	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
or PHYS 122 Physics with Cal. I	3	or PHYS 221 Physics with Cal. II	3
and PHYS 124 Physics Lab. I[6]	1	and PHYS 223 Physics Lab. II	1
Major[7]	6	Major[7]	7
Social Science Requirement[5]	3	Elective	3
	17		17

SENIOR YEAR

Major[7]	12	Major[7]	12
Elective	6	Elective	6
	18		18

135 Total Semester Hours

[1]BIOL 110 and 111 are strongly recommended. However, BIOL 103 may substitute for BIOL 110 and BIOL 104 may substitute for BIOL 111; the remaining 1-2 hours required must be satisfied by completing 1-2 extra hours in major elective courses.

[2]Select from sophomore literature courses (200 level only).

[3]Approved requirements are selected in consultation with an adviser to complement the student's curriculum.

[4]CH 228 may be substituted for BIOCH 302.

[5]Select from course offerings in social sciences (See Section E, General Education Requirements.)

[6]Physics with calculus is a three-semester sequence. Students selecting this option may wish to take PHYS 222/224 in the senior year to complete the sequence.

[7]At least one course must be taken from each of 4 course areas: (1) Genetics and Evolution, (2) Ecology and Behavior, (3) Development and Cell Biology, and (4) Physiology. The remaining courses may be selected from among the departmental course offerings at the 300 level or above.

CHEMISTRY

Chemistry, an experimental discipline based on observation guided by molecular theory, is of fundamental importance in much of modern science and technology. Its molecular concepts form the basis for ideas about complex material behavior. Due to the fundamental nature and extensive application of chemistry, an unusually large variety of challenging opportunities to contribute in the science-oriented community are open to the student whose education is built around the principles of this discipline.

The curriculum, through the career requirement options and the large number of electives, provides each student an opportunity to select a coherent program of study beyond the basic courses suited to his or her needs. Career requirement options are provided for students anticipating graduate study in chemistry or related fields; employment following the BS degree in laboratory, production, technical sales or management positions; professional studies (e.g., medicine); chemical physics; geochemistry; and employment in fields requiring extensive preparation in courses other than sciences (e.g., patent law and technical writing). Significant features of the curriculum are the student's extensive participation in experimental work and the opportunity to take part in a research investigation during the junior and senior years.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
CH 141 Chemistry Orientation	1	CH 205 Intro. to Inorganic Chemistry	2
CP SC 110 Elem. Computer Prog	3	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	PHYS 122 Physics with Cal. I	3
	15		16

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 225 Organic Chemistry Lab	2	CH 226 Organic Chemistry Lab	2
MTHSC 206 Calculus of Sev. Var	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
PHYS 221 Physics with Cal. II	3	PHYS 222 Physics with Cal. III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Foreign Language[1]	4	Foreign Language[1]	4
	17		17

JUNIOR YEAR

CH 313 Quantitative Analysis	3	CH 332 Physical Chemistry	3
CH 315 Quantitative Analysis Lab	2	CH 340 Physical Chemistry Lab	1
CH 331 Physical Chemistry	3	CH 411 Instrumental Analysis	4
CH 339 Physical Chemistry Lab	1	ENGL 314 Technical Writing	3
Literature Requirement[2]	3	Elective[3]	5
Elective[3]	3		16
	15		

SENIOR YEAR

CH 402 Inorganic Chemistry	3	Chemistry Requirement[4]	4
CH 443 Research Problems	3	Elective	13
Chemistry Requirement[4]	3		17
Elective[3]	8		
	17		

130 Total Semester Hours

[1]One year of German, French, or Russian.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]At least 3 hours must be in humanities and 6 hours in social sciences.
[4]CH 421 and 435 are recommended for students qualified for graduate studies.

COMPUTER INFORMATION SYSTEMS

The Computer Information Systems degree program is oriented toward computer applications in management-related problems. The program emphasizes functional areas of management including accounting, production, marketing and finance, and the applications of computers in these areas. The curriculum is designed to prepare students for careers in areas such as systems design and analysis, applications programming, database administration and information retrieval as well as for continued study toward an advanced degree.

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 101 Computer Science I	4	CP SC 102 Computer Science II	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
Humanities Requirement[1]	3	Social Science Requirement[1]	3
Natural Science Requirement[2]	4	Natural Science Requirement[2]	4
	18		18

SOPHOMORE YEAR

CP SC 231 Computer Science III	4	ACCT 203 Financial Accounting	3
ECON 211 Principles of Microeconomics	3	CP SC 241 Computer Science IV	4
MTHSC 119 Intro. to Discrete Methods	3	CP SC 291 Seminar in Professional Issues I	1
Literature Requirement[3]	3	MGT 301 Principles of Management	3
Natural Science Requirement[2]	3	MTHSC 210 Applied Matrix Algebra	3
	16	or MTHSC 311 Linear Algebra	3
		Social Science Requirement[1]	3
			17

JUNIOR YEAR

ACCT 307 Managerial Accounting	3	CP SC 332 Computer Systems[4]	3
CP SC 331 Computer Systems Lab	1	CP SC 361 Data Mgt. Systems Lab	1
CP SC 360 Periph. and File Design	3	CP SC 372 Intro. to Soft Development	3
MKT 301 Principles of Marketing	3	ENGL 304 Business Writing	3
MTHSC 301 Stat. Theory and Meth. I	3	or ENGL 314 Technical Writing	3
SPCH 250 Public Speaking	3	FIN 306 Corporation Finance	3
	16	Elective	3
			16

SENIOR YEAR

CP SC 371 Systems Analysis	3	CP SC 463 Online Systems	3
CP SC 462 Database Management Systems	3	Commerce and Industry Requirement[6]	3
CP SC 491 Seminar in Professional Issues II	1	Computer Science Requirement[5]	3
MGT 400 Mgt. of Org. Behavior	3	Humanities/Social Science Requirement[1]	3
or MGT 416 Mgt. of Hum. Res	3	Elective	4
MGT 402 Prod. and Op. Mgt. I	3		16
Elective	3		
	16		

133 Total Semester Hours

[1]Select to satisfy Humanities and Social Sciences section, General Education Requirements.
[2]Must include one of the following sequences: BIOL 103, 104; CH 101, 102 or 112; PHYS 122, 124, 221, 223; PHYS 207, 208.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]For a stronger emphasis on operating systems, CP SC 422 may be substituted for CP SC 332.
[5]Select from CP SC 330, 350, or any 400-level computer science course except CP SC 422.
[6]Select from ACCT 410; MA SC 413, 414; MGT 404, 408; MKT 432.
Notes:
1. For graduation, a candidate for the BS degree in Computer Information Systems must have earned a grade of C or better in each computer science course applied to the degree.
2. Before enrolling in a computer science course, a grade of C or better must be earned in all prerequisite courses.

COMPUTER SCIENCE

The Computer Science degree program is oriented toward design, implementation, and application of computer software systems to solve information processing problems in general. An "applications emphasis" in an area outside of computer science allows the program to be tailored to the needs

and interests of individual students. This curriculum is more technically oriented than the Computer Information Systems curriculum, and it prepares a student for employment in the computer software field or for continued study toward an advanced degree in computer science.

This program has been accredited by the Computer Science Accreditation Commission of the Computing Sciences Accreditation Board.

FRESHMAN YEAR

First Semester		Second Semester	
CP SC 101 Computer Science I	4	CP SC 102 Computer Science II	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
Humanities Requirement[1]	3	Social Science Requirement[1]	3
Natural Science Requirement[2]	4	Natural Science Requirement[2]	3
	18		17

SOPHOMORE YEAR

CP SC 231 Computer Science III	4	CP SC 241 Computer Science IV	4
MTHSC 119 Intro. to Discrete Math	3	CP SC 291 Seminar in Professional Issues I	1
PHYS 122 Physics with Calculus I	3	E C E 201 Logic and Computing Devices	3
PHYS 124 Physics Lab. I	1	MTHSC 311 Linear Algebra	3
Literature Requirement[3]	3	PHYS 221 Physics with Calculus II	3
Elective	3	PHYS 223 Physics Lab. II	1
	17	Social Science Requirement[1]	3
			18

JUNIOR YEAR

CP SC 330 Computer Systems Org	4	CP SC 350 Foundations of Computer Science	3
CP SC 331 Computer Systems Lab	1	CP SC 361 Data Mgt. Systems Lab	1
CP SC 360 Peripherals and File Design	3	CP SC 372 Intro. to Software Development	3
MTHSC 301 Stat. Theory and Meth. I	3	ENGL 314 Technical Writing	3
SPCH 250 Public Speaking	3	Applications Emphasis[4]	3
Applications Emphasis[4]	3	Mathematical Sciences Requirement[5]	3
	17		16

SENIOR YEAR

CP SC 422 Intro. to Operating Systems	3	Applications Emphasis[4]	3
CP SC 428 Design and Impl. of Prog. Lang	3	Computer Science Requirement[6]	3
CP SC 491 Seminar in Professional Issues II	1	Humanities/Social Sciences Requirement[1]	3
Applications Emphasis[4]	3	Nontechnical Elective[7]	3
Computer Science Requirement[6]	3	Elective	4
Elective	3		16
	16		

135 Total Semester Hours

[1]Select to satisfy Humanities and Social Sciences sections, General Education Requirements.
[2]Select from the departmental list of approved natural science courses.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]Consists of 12 hours in an applications area as specified by the department.
[5]Select from MTHSC 400, 405, 440, 441, 460 or other approved 400-level mathematical sciences courses.
[6]Select from 400-level computer science courses.
[7]Select from departmental list.

Notes:

1. For graduation, a candidate for the BS degree in Computer Science must have earned a grade of C or better in each computer science course applied to the degree.
2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next computer science course.

GEOLOGY

Geology is a relatively young science. The word itself is only about 200 years old. It means the science of the earth. Such a science must be involved with the physics and chemistry of materials which comprise the earth, but equally important it must consider the development of life on earth. Fundamentally, the chemical, physical and biological responses to various environments on and in the earth must be thoroughly understood so that the historical development of the earth may be deduced, predictions of the future

inferred, and natural resources intelligently developed.

Industry in our modern civilization is dependent on minerals and rocks. Metals have their origin in them as do our chief power sources: coal, petroleum, and radioactive minerals. The power and wealth of nations depend largely on their exploration, control and development of mineral wealth.

Geologists today are entering upon a new era. Widening horizons are indicated by employment not only in mineral-producing industries but by railroads, municipalities, engineering firms, and water authorities. For this reason, it is important that the geologist's education rest on a broad yet rigorous base.

This curriculum provides the student with the fundamentals in the geological sciences and excellent support in the other basic sciences. On successful completion of the Bachelor of Science program, the student should be adequately prepared for employment or for graduate study in any field of geology.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 102 or 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
GEOL 101 Physical Geology	3	GEOL 102 Historical Geology	3
GEOL 103 Physical Geology Lab	1	GEOL 104 Historical Geology Lab	1
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable II	4
	15		15

SOPHOMORE YEAR

BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
HIST 172 Western Civilization	3	HIST 173 Western Civilization	3
MTHSC 206 Calculus of Sev. Var	4	PHYS 122 Physics with Cal. I	3
Literature Requirement[1]	3	Humanities Requirement	3
Modern Language[2]	4	Modern Language[2]	4
	18		17

JUNIOR YEAR

ENGL 314 Technical Writing	3	EX ST 301 Introductory Statistics	3
GEOL 306 Mineralogy	3	GEOL 309 Petrology	3
PHYS 221 Physics with Cal. II	3	PHYS 222 Physics with Cal. III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Computer Science Requirement[4]	3	Elective	6
Elective	3		16
	16		

Summer Geology Field Course[3] 6

SENIOR YEAR

GEOL 402 Structural Geology	3	GEOL 403 Invertebrate Paleontology	3
GEOL 413 Stratigraphy and Sedimentation	3	GEOL 404 Economic Geology	3
Elective	10	GEOL 410 Optical Mineralogy	3
	16	Elective	6
			15

134 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]German or French is recommended. One year of the same language is required.
[3]Clemson University does not conduct a field course in geology, but attendance at a course selected from the departmental list of approved summer geology field courses is required.
[4]CP SC 110 or 120 is required.

MATHEMATICAL SCIENCES

The Mathematical Sciences curriculum, carefully designed to possess a high degree of versatility, equips the student with the knowledge of mathematical concepts and methods that are applicable in the areas of physics, computer science, communication theory, data processing, statistics, operations research, economics, or any branch of the physical sciences in which a strong

mathematical background is desired. In addition to containing the basic courses which provide the student with the mathematical skills necessary in the use of mathematics as it relates to other fields of knowledge, the curriculum allows the student in his junior year to select one of five optional sets of courses, providing an introduction to an area where mathematics is applied. These options are Applied Analysis, Biology, Computer Science, Operations Research/Management Science, and Statistics.

In addition to the overall goal of preparing the student to cope with the dynamics of any mathematical environment, the curriculum seeks to provide an adequate background for the student who plans to pursue graduate study in mathematics or to fill many interesting positions in space research, computer development, business, or government research. Those electing the Biology option will have the necessary preparation for entering medical school.

FRESHMAN YEAR

First Semester		Second Semester	
ECON 200 Economic Concepts	3	CP SC 110 Elem. Comp. Prog	3
or ECON 211 Principles of Microeconomics	3	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
HIST 172 or 173 Western Civilization	3	MTHSC 129 Prob. Solving in Disc. Math	3
MTHSC 106 Calculus of One Variable I	4	Foreign Language[1]	4
Foreign Language[1]	4		17
	17		

SOPHOMORE YEAR

MTHSC 206 Calculus of Sev. Var	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
MTHSC 250 Intro. to Math. Science	1	MTHSC 311 Linear Algebra	3
MTHSC 360 Inter. Math. Computing	3	PHYS 122 Physics with Cal. I	3
Literature Requirement[3]	3	Literature Requirement[3]	3
Natural Science Requirement[4]	4	Natural Science Requirement[4]	4
	15		17

JUNIOR YEAR

MTHSC 302 Statistics for Science and Engineering	3	MTHSC 400 Theory of Probability	3
MTHSC 440 Linear Programming	3	MTHSC 412 Introduction to Modern Algebra	3
Option	3	Option	3
Science Requirement[4]	3-4	Science Requirement[4]	3-4
Approved Requirement[2]	4-3	Approved Requirement[2]	4-3
	16		16

SENIOR YEAR

MTHSC 450 Introduction to Mathematical Models	3	MTHSC 454 Advanced Calculus II	3
MTHSC 453 Advanced Calculus I	3	or MTHSC 464 Mathematical Analysis II	3
or MTHSC 463 Mathematical Analysis I	3	Option	3
SPCH 250 Public Speaking	3	Elective	10
or ENGL 314 Technical Writing	3		16
Option	3		
Approved Requirement[2]	4		
	16		

130 Total Semester Hours

OPTIONS

Operations Research/Management Science[6]		Statistics	
I E 482 Systems Modeling	3	MA SC 414 Statistical Analysis	3
or I E 384 Engr. Econ. Analysis	3	MTHSC 403 Intro. to Statistical Theory	3
I E 486 Production Planning and Control	3	MTHSC 406 Sampling Theory and Meth	3
or MGT 402 Operations Planning and Control	3	MTHSC 407 Regress. and Time Series Analysis	3
MTHSC 407 Regress. and Time-Series Analysis	3		12
MTHSC 441 Intro. to Stochastic Models	3		
MTHSC 460 Intro. to Numerical Analysis I	3		
	15		

Applied Analysis

Applications Area[5]	6
Two of the following courses:	
MTHSC 425 Orthogonal Functions and Boundary Value Problems	3
MTHSC 435 Complex Variables	3
MTHSC 460 Intro. to Numerical Analysis I	3
	12

[1]Eight semester hours in the same language are required.
[2]These requirements must be approved by the adviser.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]Must include two of the following sequences: BIOL 103, 104; CH 101, 102, or 112; ECON 314, 405; PHYS 221/223, 222/224.
[5]These courses must be approved by the adviser. Possibilities include CH 331, 332; E M 320; MTHSC 457, 458; PHYS 321, 322, 441, 442; M E 302.
[6]ECON 314, 405.
Notes:
1. For graduation, a candidate for the BS degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point ratio in all required courses taught by the Mathematical Sciences Department including approved mathematical sciences electives and option courses.
2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next mathematical science course.

MATHEMATICAL SCIENCES—BIOLOGY OPTION

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I[1]	5	BIOL 111 Principles of Biology II[1]	5
CP SC 110 Elem. Comp. Prog.	3	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	MTHSC 129 Prob. Solving in Disc. Math	3
	15	MTHSC 250 Intro. to Math. Sciences	1
			16

SOPHOMORE YEAR

CH 101 General Chemistry	4	CH 112 General Chemistry	4
MTHSC 206 Calculus of Sev. Var	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
MTHSC 360 Inter. Math. Computing	3	MTHSC 311 Linear Algebra	3
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Literature Requirement[2]	3	Literature Requirement[2]	3
	18		18

JUNIOR YEAR

CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 227 Organic Chemistry Lab	1	CH 228 Organic Chemistry Lab	1
MTHSC 302 Statistics for Science and Engineering	3	MTHSC 400 Theory of Probability	3
MTHSC 440 Linear Programming	3	MTHSC 412 Introduction to Modern Algebra	3
Foreign Language[3]	4	Foreign Language[3]	4
Elective	2	Elective	2
	16		16

SENIOR YEAR

ECON 200 Economic Concepts	3	HIST 172 or 173 Western Civilization	3
or ECON 211 Principles of Microeconomics	3	MTHSC 454 Advanced Calculus II	3
MTHSC 450 Intro. to Math. Models	3	or MTHSC 464 Mathematical Analysis II	3
MTHSC 453 Advanced Calculus I	3	SPCH 250 Public Speaking	3
or MTHSC 463 Math. Analysis I	3	or ENGL 314 Technical Writing	3
Animal Diversity or Plant Diversity Requirement[4]	4	Biological Science Requirement[5]	4-3
Elective	3	Elective	2-3
	16		15

130 Total Semester Hours

[1]Those qualifying for advanced placement in languages or wanting to take languages the freshman year may take them in place of these courses.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]In the same language.
[4]BIOSC 302, 303, 304, 305.
[5]Select from BIOCH 301, GEN 302, MICRO 305 or any 300- and 400-level biological science or zoology course.
Notes:
1. For graduation, a candidate for the BS degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point ratio in all required courses taught by the Mathematical Sciences Department including approved mathematical sciences electives and option courses.
2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next mathematical science course.

MATHEMATICAL SCIENCES—COMPUTER SCIENCE OPTION

FRESHMAN YEAR

First Semester		Second Semester	
ECON 200 Economic Concepts	3	CP SC 110 Elem. Comp. Prog	3
or ECON 211 Principles of Microeconomics	3	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of one Variable II	4
HIST 172 or 173 Western Civilization	3	MTHSC 129 Prob. Solving in Disc. Math	3
MTHSC 106 Calculus of One Variable I	4	Foreign Language[1]	4
Foreign Language[1]	4		17
	17		

SOPHOMORE YEAR

CP SC 210 Programming Methodology	4	CP SC 240 Introduction to Data Structures	3
MTHSC 206 Calculus of Several Variables	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
MTHSC 250 Introduction to Mathematical Science	1	MTHSC 311 Linear Algebra	3
Literature Requirement[3]	3	Literature Requirement[3]	3
Science Requirement[4]	4	Science Requirement[4]	4
	16		17

JUNIOR YEAR

MTHSC 302 Statistics for Science and Engineering	3	ENGL 314 Technical Writing	3
MTHSC 360 Inter. Math. Comp	3	or SPCH 250 Public Speaking	3
MTHSC 440 Linear Programming	3	MTHSC 400 Theory of Probability	3
PHYS 122 Physics with Cal. I	3	MTHSC 412 Intro. to Mod. Alg	3
Science Requirement[4]	3-4	Computer Science Requirement[5]	4-3
	15-16	Science Requirement[4]	3-4
			16

SENIOR YEAR

MTHSC 450 Intro. to Math. Models	3	MTHSC 454 Advanced Calculus II	3
MTHSC 453 Advanced Calculus I	3	or MTHSC 464 Math. Analysis II	3
or MTHSC 463 Math. Analysis I	3	Computer Science Requirement[5]	3
MTHSC 460 Intro. to Num. Analysis I	3	Elective	10
Approved Requirement[2]	7-9		16
	16-18		

130 Total Semester Hours

[1]Eight semester hours in the same language are required.
[2]These electives must be approved by the adviser.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]Must include two of the following sequences: BIOL 103, 104; CH 101, 102 or 112; ECON 314, 405; PHYS 221/ 223, 222/ 224.
[5]Choose one of the following sequences: CP SC 231, 428; 350, 450; 360, 462 or any two courses from CP SC 231, 350, 360, 372 or MTHSC 461.

Notes:

1. For graduation, a candidate for the BS degree in Mathematical Sciences will be required to have a 2.0 or higher cumulative grade-point ratio in all required courses taught by the Mathematical Sciences Department including approved mathematical sciences electives and option courses.
2. A grade of C or better must be earned in all prerequisite courses before enrolling in the next mathematical science course.

MEDICAL TECHNOLOGY

Medical technology is the area of health care in which analyses are performed on human body fluids in order to detect disease conditions. The medical technologist in a modern hospital laboratory must know how to perform and evaluate tests made in several broad disciplines, which include clinical chemistry, clinical microbiology, immunohematology, hematology, and blood bank. In order to perform in such diversified areas medical technologists are required to have a broad education in the basic sciences and rigorous training in clinical laboratory science. Medical technologists must know both the principles of test procedures and equipment, as well as the significance of the results of these tests in a diagnosis and treatment of disease. Medical technologists find employment in hospital clinical laboratories and in private, state, and federal health laboratories.

The program in Medical Technology at Clemson University consists of

three years of lectures and laboratories on the Clemson campus and one year of clinical experience at an accredited school of medical technology. The courses required in the first three years of the program must be completed before the student can begin the clinical (fourth) year. The student must be in good standing at the University and have a grade-point ratio of 2.0 or above before entering a school of medical technology. Admission to these schools is by competition. Each school selects the students who will come to their school. This selection is made on the basis of published admission criteria which include grade-point ratio, grades in science courses, letters of reference, and interviews. Clemson University is affiliated with Anderson Memorial Hospital and McLeod Regional Medical Center. Applications to these schools should be made during the first semester of the junior year.

Upon satisfactory completion of the requirements of the curriculum, the student will receive the Bachelor of Science degree in Medical Technology from Clemson University. In addition to the degree, satisfactory performance on a certification exam is required by most employers.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I	5	BIOL 111 Principles of Biology II	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
M T 101 Intro. to Med. Tech	1	EX ST 301 Introductory Statistics	3
MTHSC 106 Calculus of One Variable I	4	or MTHSC 301 Stat. Theory and Meth. I	3
	17	Elective	3
			18

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	BIOCH 301 General Biochemistry	3
CH 227 Organic Chemistry Lab	1	CH 224 Organic Chemistry	3
HIST 172 or 173 Western Civilization	3	CH 228 Organic Chemistry Lab	1
MICRO 305 General Microbiology	4	PHYS 208 General Physics II	4
PHYS 207 General Physics I	4	Humanities Requirement[3]	3
Literature Requirement[1]	3	Elective	3
	18		17

JUNIOR YEAR

CH 313 Quantitative Analysis	3	GEN 302 Introductory Genetics	4
CH 317 Quan. Anal. Lab	1	MICRO 411 Pathogenic Bacteriology	4
MICRO 414 Basic Immunology	3	Humanities Requirement[3]	3
English Requirement[2]	3	Option Requirement[4]	3
Elective	4	Social Science Requirement[3]	3
	14		17

SENIOR YEAR
(52 Weeks)

M T 401 Immunology	3
M T 402 Clinical Microbiology	8
M T 403 Hematology and Hemostasis	5
M T 404 Blood Bank	4
M T 407 Urinalysis	2
M T 408 Clinical Chemistry	10
M T 491 Special Topics in Med. Tech	2
	34

135 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]Select from advanced writing or public speaking.
[3]Select from courses required to complete an alternate degree in Microbiology should the student not be accepted to a hospital school after completion of the academic requirement for the baccalaureate degree in Medical Technology.
[4]The option requirement is to be selected from the following: MICRO 400, 401, 412, 413, 415, 416, ZOOL 456, and other courses that will serve as background courses for medical technology.
Note: The manner in which each accredited clinical program implements the above curriculum may vary because of institutional differences.

MICROBIOLOGY

Microbiology deals with the study of bacteria, viruses, yeasts, filamentous fungi, protozoa, and unicellular algae. The microbiologist seeks to describe these organisms in terms of their structures, functions and processes of reproduction, growth and death, at both the cellular and molecular levels. He is also concerned with their ecology, particularly in regard to their pathological effects on man, and with their economic importance.

The Microbiology major provides a thorough training in the basic microbiological skills. Furthermore, the student receives instruction in mathematics, physics, chemistry, and biochemistry, all of which are essential to the training of a modern-day microbiologist. Through a wide choice of electives, the program allows a student to prepare for a variety of careers. The Microbiology curriculum with Molecular Biology option is recommended for students planning postgraduate programs. The microbiology graduate may enter graduate school in the fields of microbiology, biochemistry, bioengineering or related disciplines; he may enter a medical or dental school; or pursue a career in one of the many industries or public service departments dependent upon microbiology. Some of these are the fermentation and drug industries, medical and public health microbiology, various food industries, and agriculture.

Microbiology majors planning to apply for admission to a medical or dental school should inform their advisers immediately upon entering the Microbiology program.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I[1]	5	BIOL 111 Principles of Biology II[1]	5
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	MICRO 100 Microbes and Human Affairs	1
	16	Mathematical Science Requirement[2]	3-4
			16-17

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	BIOCH 301 General Biochemistry	3
CH 227 Organic Chemistry Lab	1	CH 224 Organic Chemistry	3
MICRO 305 General Microbiology	4	CH 228 Organic Chemistry Lab	1
Literature Requirement[3]	3	Literature Requirement[3]	3
Mathematical Science or Science Requirement[4]	3-4	Mathematical Science or Science Requirement[4]	4-3
Social Science Requirement	3	Microbiology Requirement[5]	3
	17-18		17-16

JUNIOR YEAR

MICRO 401 Adv. Bacteriology	4	MICRO 412 Bacterial Physiology	4
SPCH 250 Public Speaking	3	MICRO 415 Microbial Genetics	4
Physics Requirement[6]	4-3	Physics Requirement[6]	4
Elective	6-7	Social Science Requirement	3
	17	Elective	3
			18

SENIOR YEAR

Social Science Requirement	3	MICRO 411 Pathogenic Bacteriology	4
Approved Requirement[5]	14-13	Approved Requirement[5]	12
	17-16		16

134 Total Semester Hours

[1]BIOL 103 may substitute for BIOL 110 and BIOL 104 may substitute for BIOL 111; the remaining 1-2 hours required must be satisfied by completing 1-2 extra hours in either biological sciences or microbiology.

[2]MTHSC 108 is required for the Microbiology-Molecular Biology option. Microbiology majors may select MTHSC 108 or 301.

[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.

[4]Select from CP SC 110, 120, EX ST 301, GEOL 101, MTHSC 108, or any course at the sophomore level or above offered

by the College of Sciences, excluding microbiology.
[5]A minimum of 15 credits must be selected from the following courses: BOT 411, 413, MICRO 400, 403, 407, 410, 413, 414, 416, 417, 491, PL PA 456, P S 458, ZOOL 403, 456.
[6]To be selected from the following course sequences: either PHYS 207, 208 or 122, 221, 223.

MICROBIOLOGY—MOLECULAR BIOLOGY OPTION

See Microbiology curriculum for Freshman year.

SOPHOMORE YEAR

First Semester		Second Semester	
CH 223 Organic Chemistry	3	BIOCH 301 General Biochemistry	3
CH 227 Organic Chemistry Lab	1	CH 224 Organic Chemistry	3
MICRO 305 General Microbiology	4	CH 228 Organic Chemistry Lab	1
Literature Requirement[1]	3	Literature Requirement[1]	3
Mathematical Science Requirement[3]	3	Microbiology Requirement[2]	3
Social Science Requirement	3	Social Science Requirement	3
	17		16

JUNIOR YEAR

MICRO 401 Advanced Bacteriology	4	CH 313 Quantitative Analysis	3
MICRO 414 Basic Immunology	3	or PHYS 417 Intro. to Biophysics I	3
SPCH 250 Public Speaking	3	MICRO 412 Bacterial Physiology	4
Physics Requirement[4]	4-3	MICRO 417 Mol. Mech. of Carcinogen and Aging	3
Elective[5]	3-4	Physics Requirement[4]	4
	17	Elective[5]	3
			17

SENIOR YEAR

BIOCH 423 Prin. of Biochemistry	3	BIOCH 432 Biochemistry of Metabolism	3
MICRO 415 Microbial Genetics	4	MICRO 411 Path. Bacteriology	4
MICRO 416 Introductory Virology	3	MICRO 491 Special Problems	3
Social Science Requirement	3	Elective	8
Elective	3		18
	16		

134 Total Semester Hours

[1]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[2]Select from BOT 411, 413, MICRO 400, 403, 407, 410, 413, PL PA 456, P S 458, ZOOL 403, 456.
[3]Select from CP SC 110, 120, EX ST 301, MTHSC 301.
[4]Select from the following course sequences: Either PHYS 207, 208 or 122, 221, 223.
[5]Should include one of the following courses: CH 313, 317, CP SC 110, EX ST 301.
Note: Recommended electives in addition to those listed above are BIOCH 433, 434, BIO E 401, MTHSC 206, ZOOL 459.

PHYSICS

Physics is the most fundamental of the natural sciences, and it forms the basis upon which the study of other branches of science is founded. Physics is concerned with the fundamental behavior of matter and energy. Classical physics encompasses the fields of mechanics, heat and thermodynamics, electricity and magnetism, acoustics and optics. Modern physics is concerned with the study of atoms and molecules, atomic nuclei, elementary particles and the properties of liquids, crystalline solids, and other materials. It also includes the areas of relativity, cosmology, and the large-scale structure of the universe.

The undergraduate Physics curricula are designed to provide students with a strong background in the classical areas of physics as well as a basic introduction into the more important aspects of modern physics. The BS in Physics curriculum is directed toward preparing students for graduate study ultimately leading to the PhD degree or toward research and development work in industrial or governmental laboratories. It also provides a good background for graduate study or industrial work in many areas of engineering and applied science. Experimental modern physics is strongly emphasized.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4	CH 112 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
HIST 172 or 173 Western Civilization	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	PHYS 122 Phys. with Cal. I	3
PHYS 101 Current Topics in Modern Physics	1	PHYS 124 Physics Lab. I	1
	15		15

SOPHOMORE YEAR

MTHSC 206 Calculus of Sev. Var	4	CP SC 110 Elementary Computer Programming	3
PHYS 221 Phys. with Cal. II	3	MTHSC 208 Intro. to Ord. Diff. Equa	4
PHYS 223 Physics Lab. II	1	PHYS 222 Physics with Cal. III	3
Foreign Language Requirement[1]	4	PHYS 224 Physics Lab. III	1
Literature Requirement[2]	3	Foreign Language Requirement[1]	4
	15	Literature Requirement[2]	3
			18

JUNIOR YEAR

ENGL 314 Technical Writing	3	PHYS 322 Mechanics II	3
or SPCH 250 Public Speaking	3	PHYS 326 Experimental Physics II	3
MTHSC 425 Orthogonal Functions and Boundary Value Problems	3	PHYS 441 Electromagnetics I	3
PHYS 321 Mechanics I	3	Concentration Area[3]	3
PHYS 325 Experimental Physics I	3	Elective	6
PHYS 355 Modern Physics	3		18
Concentration Area[3]	3		
	18		

SENIOR YEAR

PHYS 442 Electromagnetics II	3	PHYS 401 Senior Thesis I	3
PHYS 455 Quantum Physics I	3	Concentration Area[3]	3
PHYS 465 Thermodynamics and Statistical Mech	3	Science Requirement[4]	3
Concentration Area[3]	3	Elective	6
Social Science Requirement	3		15
	15		

129 Total Semester Hours

[1]Two semesters of the same language to be selected from either French, German, or Russian.
[2]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[3]The Area of Concentration may be chosen from the following: Chemistry, Computer Science, Earth Science, Engineering, Environmental Science, Mathematical Science, and Physics and Astronomy. The student will take a total of 12 credits in one of these areas, at least 6 of which must be at the 300-400 level. It should be noted that the requirements for a minor in one of these areas might be satisfied with 3 additional credits at the 300-400 level.
[4]The Science requirement will be fulfilled by courses in the disciplines listed in (3) above at the 300-400 level in a discipline other than that chosen for the Concentration Area.

PHYSICS—BIOPHYSICS OPTION

The Physics–Biophysics option offers an excellent preparation for medical school or graduate work in biological sciences. It includes the flexibility of selecting courses in chemistry, biological sciences, physics, and mathematics.

FRESHMAN YEAR

First Semester		Second Semester	
BIOL 110 Principles of Biology I	5	CH 102 General Chemistry	4
CH 101 General Chemistry	4	ENGL 102 Composition II	3
ENGL 101 Composition I	3	MTHSC 108 Calculus of One Variable II	4
MTHSC 106 Calculus of One Variable I	4	PHYS 122 Physics with Calculus I	3
PHYS 101 Current Topics in Modern Physics	1	PHYS 124 Physics Lab. I	1
	17	Elective	3
			18

SOPHOMORE YEAR

MTHSC 206 Calculus of Several Variables	4	MTHSC 208 Intro. to Ord. Diff. Equa	4
PHYS 221 Physics with Calculus II	3	PHYS 222 Physics with Calculus III	3
PHYS 223 Physics Lab. II	1	PHYS 224 Physics Lab. III	1
Biophysics Requirement[1]	4	Biophysics Requirement[1]	4
Literature Requirement[3]	3	Literature Requirement[3]	3
	15		15

JUNIOR YEAR

FR 101 Elementary French[2]	4	FR 102 Elementary French[2]	4
or GER 101 Elementary German[2]	4	or GER 102 Elementary German[2]	4
PHYS 321 Mechanics I	3	HIST 172 or 173 Western Civilization	3
PHYS 325 Experimental Physics I	3	PHYS 322 Mechanics II	3
PHYS 355 Modern Physics	3	PHYS 441 Electromagnetics I	3
Biophysics Requirement[1]	3	Biophysics Requirement[1]	3
	16		16

SENIOR YEAR

CP SC 110 Elementary Computer Programming	3	ENGL 314 Technical Writing	3
PHYS 442 Electromagnetics II	3	or SPCH 250 Public Speaking	3
PHYS 455 Quantum Physics I	3	Biophysics Requirement[1]	3
PHYS 465 Thermodynamics and Statistical Mech[4]	3	Physics (as approved)	3
Elective	3	Social Science Requirement[5]	3
	15	Elective	4
			16

128 Total Semester Hours

[1]Select from an approved course list from offerings in physics, chemistry, mathematics, and the biological sciences. At least 6 credits must be in the biological sciences.
[2]RUSS 101, 102 may be substituted.
[3]ENGL 202, 203, 204, 205, 206, 207, 208, 209.
[4]An approved physics course may be substituted for PHYS 465 if the student satisfactorily completes CH 331, 332.
[5]See General Education Requirements.

PREPROFESSIONAL HEALTH STUDIES

The health professions, such as medicine and dentistry, need individuals with a diversity of educational backgrounds and a wide variety of talents and interests. The philosophies of education, the specific preprofessional course requirements, the noncognitive qualifications for enrollment, and the systems of training vary among the professional health schools, but all recognize the desirability of a broad education—a good foundation in the natural sciences (biology, chemistry, mathematics, and physics), highly developed communication skills, and a solid background in the humanities and social sciences. The absolute requirements for admission to professional health schools are purposely limited to allow latitude for developing individualized undergraduate programs of study; however, almost all schools of medicine and dentistry require sixteen semester hours of chemistry, including organic chemistry, eight semester hours of biological sciences, eight semester hours of physics, and at least one course in calculus. These requirements in the natural sciences should be balanced with courses in vocabulary building, the humanities (literature, music, art, history, philosophy), and social sciences (economics, political science, psychology, sociology). The basic requirements in the natural sciences and as many as possible of the courses in the humanities and the social sciences should be completed by the third year of study so that the student will be prepared to take the Dental Admission Test or the Medical College Admission Test prior to making application to a professional school.

Undergraduates may prepare also to study optometry, podiatry, and other health professions. While the basic requirements for these professional schools are essentially the same as those for schools of medicine and dentistry, specific requirements for individual schools in these professions vary somewhat; consequently, the interested student is advised to consult with the chief health professionals adviser.

At Clemson, rather than having a separate, organized preprofessional health study program, it is felt that an undergraduate student should be allowed to major in any curriculum, so long as the basic entrance require-

ments of the chosen professional health school are fulfilled. These schools are not so much concerned about a student's major as they are concerned that the student does well in whichever curriculum he chooses.

Professional health schools have neither preferences nor prejudices concerning any curriculum, which is evidenced by the fact that their entering students represent a broad spectrum of curricula. The emphasis is placed on the student doing well in the curriculum chosen, and this becomes critical as competition increases for the limited number of places available in professional health schools.

PREPHYSICAL THERAPY

Prephysical Therapy is a curriculum designed to meet the requirements of the Physical Therapy program at the Medical University of South Carolina. This program requires 90 semester hours of undergraduate coursework. In addition, the student must apply to the Medical University of South Carolina for acceptance into the program.

Because preparation requires three years, students are advised to select a major with similar requirements after consultation with the Prephysical Therapy adviser. The following curriculum along with an additional 30 hours will fulfill the requirements for the Physical Therapy program at the Medical University of South Carolina.

FIRST YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
CH 101 General Chemistry[1]	4	CH 102 General Chemistry	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
PSYCH 201 Intro. to Psychology	3	Mathematical Sciences Requirement[2]	3
Mathematical Sciences Requirement[2]	3-5	Social Science Requirement	3
	17-19		17

SECOND YEAR

BIOSC 222 Human Anatomy and Physiology I	4	BIOSC 223 Human Anatomy and Physiology II	4
PHYS 207 General Physics I[1]	4	PHYS 208 General Physics II	4
PSYCH 340 Life-Span Developmental Psychology	3	Humanities Requirement	6
or PSYCH 343 Psych. Dev. from Concep. to Adol	3	Literature Requirement[4]	3
English Requirement[3]	3		17
Elective	3		
	17		

THIRD YEAR[5]

90 Total Semester Hours

[1]Chemistry requires proficiency in algebra, and physics requires proficiency in trigonometry; therefore, entering freshmen must present a score of 550 or above on Level II of the Mathematics Achievement Test or register in the first semester for MTHSC 105.

[2]Six hours in mathematical sciences or EX ST 301. MTHSC 105 can be taken if necessary to satisfy the footnote above.

[3]See Composition and Speaking Skills, General Education Requirements.

[4]ENGL 202, 203, 204, 205, 206, 207, 208, 209.

[5]Applied science and courses to be selected after consultation with an adviser to a total of at least 90 hours. (See General Education Requirements.)

PREPHARMACY

Prepharmacy is a five-year program. The first two years can be taken at Clemson as a Prepharmacy major. Upon completion of the following curriculum, the student will transfer to a college of pharmacy, usually the Medical University of South Carolina or the University of South Carolina. The Bachelor of Pharmacy is awarded by the institution attended. It is

important for the student to work closely with the adviser as there are variations in courses required by the pharmacy schools.

FIRST YEAR

First Semester		Second Semester	
BIOL 103 General Biology I	4	BIOL 104 General Biology II	4
CH 101 General Chemistry[1]	4	CH 112 General Chemistry[1]	4
ENGL 101 Composition I	3	ENGL 102 Composition II	3
MTHSC 106 Calculus of One Variable I	4	History or Economics Requirement[2]	3
History Requirement[2]	3	Other Required Courses[3]	4
	18		18

SECOND YEAR

CH 223 Organic Chemistry	3	CH 224 Organic Chemistry	3
CH 227 Organic Chemistry Lab	1	CH 228 Organic Chemistry Lab	1
PHYS 207 General Physics I	4	PHYS 208 General Physics II	4
Other Required Courses[3]	10	Other Required Courses[3]	10
	18		18

72 Total Semester Hours

[1]Chemistry requires proficiency in algebra, and physics requires proficiency in trigonometry; therefore, entering freshmen must present a score of 550 or above on Level II of the Mathematics Achievement Test or register in the first semester in MTHSC 105.

[2]Six hours of history are required by the Medical University of South Carolina; 3 hours each of history and economics are required by the University of South Carolina.

[3]Courses are to be selected after consultation with an adviser. Six hours of liberal arts or humanities are required by the Medical University of South Carolina; BIOSC 222 and 223 are required by the University of South Carolina.

Courses of Instruction

This list of courses includes for each course the catalog number, title of course, credit in semester hours, class laboratory hours per week, and the description of the course. In general, courses numbered 600 and above are graduate courses and are open only to students admitted to the graduate school, except that seniors with exceptional records may be enrolled with special permission. Where courses are offered on a schedule, there is a designation F, S, or SS following the title of each course, indicating whether it is customarily offered in the fall, spring, or summer school.

ACCOUNTING (ACCT)

Professors: E. L. Bryan, L. S. Cash, J. R. Davis, T. L. Dickens, G. T. Friedlob, J. G. Louderback, J. E. Trapnell, *Director;* J. A. Turner, Jr.; *Associate Professors:* R. K. Doost, A. C. Drews-Bryan, L. P. Ramsay, L. S. Schleifer, R. E. Welton, Jr.; *Assistant Professors:* H. D. Glover, R. M. Lagrone, J. J. McMillan, J. B. Price; *Lecturers:* T. R. Bismack, J. C. Blackburn, N. E. Byerley, V. D. Guide, M. A. Prater, C. J. Ringeisen

101 (FIN) Accounting and Finance Orientation 1(1,0) A broad overview of the nature of accounting and finance and their role in the industrial, financial, and governmental environments. If taken for credit, this course must be completed before or concurrently with ACCT 200 or 201. To be taken Pass/Fail only. *Preq:* Freshman or sophomore standing or consent of instructor.

200 Basic Accounting 3(3,0) This course is designed as a general survey of accounting for the student requiring only a basic knowledge of principles and concepts. May not be taken by students in curricula requiring ACCT 201 or 203.

201, H201 Principles of Accounting 3(3,0) Introduction to the role of accounting, basic concepts and methodology, processing of business transactions, valuation and income determination principles, and financial statement preparation.

202, H202 Principles of Accounting 3(3,0) Continuation of ACCT 201, covering accounting for the corporate form of the business entity and elements of accounting management planning, budgeting, and control. Emphasis is on management uses of accounting information. *Preq:* ACCT 201.

203 Financial Accounting 3(3,0) Emphasizes the principles and methods which influence the financial statements provided to external users. May not be taken by students in curricula requiring ACCT 200 or 201.

204 Accounting Procedures 1(1,2) Lectures, demonstrations, and hands-on experience with accounting systems and analysis required to complete the accounting cycle and prepare financial statements. Intended for students who will enroll in ACCT 301. *Preq:* ACCT 201. *Coreq:* ACCT 202.

210 Federal Taxation for non-Accountants 3(3,0) Survey of the taxation of individuals, corporations, partnerships, estates, gifts, and trusts for the general business and nonbusiness student. Open to all majors but may not be taken for credit by Accounting or Financial Management majors.

301, H301 Intermediate Accounting 3(3,0) Indepth treatment of the traditional financial accounting topics of current assets, noncurrent assets, and present values as well as recent developments in accounting valuation, reporting practices, environment of accounting, and basic theory underlying financial accounting. *Preq:* ACCT 202.

302, H302 Intermediate Accounting 3(3,0) Indepth treatment of the traditional financial accounting topics of current liabilities, long-term liabilities, stockholders' equity, earnings per share, investments, revenue recognition, leases, and statement of

changes in financial position. *Preq:* ACCT 301.

303, H303 Cost Accounting 3(3,0) The application of cost analysis to manufacturing and distributing problems. Analysis of behavior characteristics of business costs and a study of principles involved in standard cost systems. Lectures and problems. *Preq:* ACCT 202.

307, H307 Managerial Accounting 3(3,0) Emphasizes internal use of accounting data by the manager in establishing plans and objectives, controlling operations, and making decisions involved with management of an enterprise. Cannot be taken for credit by Accounting majors. *Preq:* ACCT 202 or 203.

322 Accounting Information Systems 3(3,0) Formerly ACCT 422. Study of computer-based accounting systems with attention to systems design, application, internal control, auditing the system, and system security. *Preq:* ACCT 301 and CP SC 130.

340 Internal Auditing Theory 3(3,0) Formerly ACCT 440. Introduces the student to internal auditing and covers internal auditing standards, ethics, concepts, audit techniques, and reporting practices. *Preq:* ACCT 301.

401 Financial Accounting Problems 3(3,0) Indepth treatment of the traditional financial accounting topics of deferred income taxes, pension costs, accounting changes and error analysis, disclosure, accounting for partnerships, as well as introduction to fund accounting concepts. *Preq:* ACCT 302.

404, H404, 604 Individual Taxation 3(3,0) Interpretation of Federal income tax laws, regulations, and court decisions with practice in application of these laws to the returns of individuals, partnerships, and corporations. *Preq:* ACCT 202 or 203 with consent of instructor.

405 Corporate Taxation 3(3,0) Tax planning and research, income taxation with emphasis on special problems applicable to corporations, partnerships, estates, and trusts. *Preq:* ACCT 202 or 203 with consent of instructor.

406 Business Taxation 3(3,0) Provides an introduction to the importance of taxation in business decision-making. Emphasizes the interrelationship of taxes, the choice of business form, and various business transactions. Exposes students to the breadth of business decisions which are affected by the Federal Income Tax. *Preq:* ACCT 202 or 203 and consent of instructor.

407 Accounting Research 1(1,0) Directed research course for students interested in a career in accounting. *Preq:* ACCT 302 and ENGL 304.

410, 610 Budgeting and Executive Control 3(3,0) Study and application of selected techniques used in the planning and control functions of business organizations. *Preq:* ACCT 303 or 307.

411 Financial Accounting Problems 3(3,0) Study of accounting principles and practices relating to business combinations and foreign operations. *Preq:* ACCT 401 or consent of instructor.

415 Auditing 3(3,0) Professional and practical auditing theory. Review of internal controls, audit procedures, and development of audit programs for various types of businesses; consideration of auditor's professional and ethical standards. *Preq:* ACCT 302, 322.

416 Auditing in an Electronic Data Processing Environment 3(3,0) Application of electronic data processing controls as they relate to the auditing function. The course focuses on the evaluation of controls and data in an automatic environment. *Preq:* ACCT 322 and 415 or consent of instructor.

425 Contemporary Accounting Theory 3(3,0) Contemporary accounting theory emphasizes the major challenges and controversies within the field of accounting today. Attention is given to theoretical and conceptual issues underlying current financial reporting as well as pragmatic conventions. The evolution of accounting objectives and standards, as evidenced by the pronouncements of professional organizations, will receive special emphasis. *Preq:* ACCT 302.

430, 630 Governmental and Institutional Accounting 3(3,0) Accounting and reporting principles, standards, and procedures used by the Federal government, state and local governments, and other not-for-profit institutions are examined and discussed. Hospi-

tal and university accounting are reviewed. Unique aspects of the governmental auditing environment are analyzed. *Preq:* ACCT 302 or consent of instructor.

445 Internal Auditing Practice 3(3,0) Expands the student's knowledge of internal auditing practice, including operation audits, organization audits, quality-control audits, and organization theory. *Preq:* ACCT 340.

801 Contemporary Financial Accounting Theory 3(3,0)

802 Auditing Seminar 3(3,0)

803 Accounting Information Systems 3(3,0)

804 Environment of Accounting 3(3,0)

805 Research Seminar in Accounting 1(1,0)

806 Seminar in Current Accounting Problems 3(3,0)

807 Advanced Auditing Techniques 3(3,0)

814 Taxation of Business Entities 3(3,0)

815 Federal and State Income Taxation of Corporations 3(3,0)

816 Taxation of Estates, Gifts and Fiduciaries 3(3,0)

817 Tax Research 3(3,0)

818 Taxation of Partnerships 3(3,0)

819 Current and Special Topics in Taxation 3(3,0)

820 Advanced Topics and Planning in Taxation 3(3,0)

821 Controllership 3(3,0)

830 Governmental and Not-for-Profit Accounting 3(3,0)

840 Internal Auditing Seminar 3(3,0)

AEROSPACE STUDIES (A S)

Professor: A. C. Whitley, Jr., *Head; Assistant Professors:* M. R. Fredette, R. S. Petree, Jr., G. W. Rinehart

109 Air Force Today I 1(1,1) Course deals with the Air Force in the contemporary world through a study of the total force structure: strategic offensive and defensive, general purpose, and aerospace support. Leadership laboratory activities include drill fundamentals, customs, and courtesies of the service.

110 Air Force Today II 1(1,1) Continuation of A S 109. Leadership laboratory includes drill, ceremonies, and an introduction to Air Force career opportunities.

209 Development of Air Power I 1(1,0) The course includes the study of the development of air power from balloons and dirigibles through the peaceful employment of U.S. air power in relief missions and civic action programs in the late 1970's and also the air war in Southwest Asia. Leadership laboratory provides experience in guiding, directing, and controlling an Air Force unit.

210 Development of Air Power I (1,1) Continuation of A S 209.

309 Air Force Leadership and Management I 3(3,1) Course emphasizing the individual as a manager. Individual motivational and behavioral processes, leadership, communication, and group dynamics are covered to provide a foundation for the development of the Air Force officer's professional skills. Students will prepare individual and group presentations; write reports; participate in group discussions, seminars, and conferences.

310 Air Force Leadership and Management II 3(3,1) Continuation of A S 309, using the basic managerial processes involving decision-making, utilization of analytical aids in planning, organizing, and controlling environment. Actual case studies are used to enhance learning and communication processes.

409 National Security Policy I 3(3,1) Analysis of the role and function of the military officer in a democratic society and the relationships involved in civil-military interactions. Students will be expected to prepare individual and group presentations for the

class, write reports, and participate in group discussions.

410 National Security Policy II 3(3,1) Continuation of A S 409, examining the environmental context in which U.S. defense policy is formulated and implemented. Emphasis placed on initial commissioned service and military justice. Students will be expected to prepare individual and group presentations for the class, write reports, and participate in group discussions, seminars, and conferences.

AGRICULTURAL AND APPLIED ECONOMICS (AP EC)

Professors: L. L. Bauer, G. L. Bradford, *Head;* B. L. Dillman, M. D. Hammig, M. S. Henry, J. C. Hite, K. H. Kahl, E. L. McLean, S. E. Miller, J. C. Nyankori, C. M. Sieverdes, C. S. Thompson, W. A. Ward, G. J. Wells; *Associate Professors:* C. E. Curtis, Jr., E. H. Kaiser, R. S. Pomeroy; *Assistant Professor:* W. M. Smathers, Jr.

202 Agricultural Economics 3(3,0)F, S Analytical survey of the various subdivisions of agricultural economics, to include farm organization, enterprise, land economics, marketing, farm prices, governmental farm policies, and the relation of agriculture to the national and international economy.

302 Economics of Farm Management 3(2,3)F Economic principles underlying the organization and operation of agricultural firms and related business enterprises. Particular emphasis is directed to management aspects of the farm as a production unit. *Preq:* AP EC 202 or ECON 211.

308 Quantitative Applied Economics 3(3,0)S Basic quantitative relationships in applied economics are examined and interpreted. Emphasis is placed on the mathematical aspects of applied economics. Microcomputer software will be utilized for problem solving.

309, H309 Economics of Agricultural Marketing 3(3,0)F General course in marketing agricultural commodities with particular emphasis upon food products. Efficiency criteria, consumer behavior, market organizations and institutions, and marketing functions are analyzed. *Preq:* AP EC 202.

313 Principles of Real Estate Appraisal 3(3,0) Introduction to the basic principles and procedures of real estate appraisal. Topics include the real estate market; principles of valuation; legal concepts; and the application of the comparable sales, cost, and income approaches to real estate valuation. *Preq:* FIN 307 or consent of instructor.

319 Agribusiness Management 3(3,0)F Study of the principles used in making management decisions and the application of these principles in agribusiness. Emphasis is given to the application of economics to the solution of problems facing managers of agricultural supply and marketing firms. *Preq:* AP EC 302 or 309.

351 Agricultural Sales, Merchandising, and Advertising 3(3,0)F Examination of professional selling and the roles and mechanisms of sales promotion and advertising in an agricultural environment. Topics include the sales process, promotion, and merchandising devices, media advertising, and display. *Preq:* Junior standing.

352 Public Finance 3(3,0)S Principles of financing government, sources of public revenue, objects of public expenditures, problems of fiscal administration, and the application of fiscal policies in stablizing the national economy. *Preq:* Junior standing.

402, 602 Production Economics 3(3,0)F Economic analysis of agricultural production involving the concept of the farm as a firm, principles for decision making, the quantitative nature and use of production and cost functions and their interrelations and application of these principles to resource allocation in farms and among areas. *Preq:* AP EC 308 and ECON 314.

403, 603 Land Economics 3(3,0)S Study of the characteristics of land and of the physical, legal, social, and economic principles and problems relating to the control and use of land resources. *Preq:* AP EC 202 or ECON 200.

406 Seminar 1(1,0)S Examination of the relation of economics and sociology to specific problems. *Preq:* Senior standing.

409, 609 Commodity Futures Markets 3(3,0)F Introduction to the economic theory, organization, and operating principles of agricultural commodity futures markets in the U.S. Emphasis is placed on speculating, hedging, and investing in agricultural com-

modity futures contracts from the standpoint of the agribusiness entrepreneur. *Preq:* AP EC 202 or ECON 211.

411, 611 (C R D) Regional Impact Analysis 2(2,0) See C R D 411.

412, 612 (C R D) Spatial Competition and Rural Development 3(3,0) See C R D 412.

413, 613 Advanced Real Estate Appraisal 3(3,0) Topics covered include highest and best use analysis, data collection, and analyses. Advanced appraisal procedures for income, cost and comparable sales approach to real estate valuation will be stressed. Eminent domain, the appraisal of property in transition, and specialized property will be covered. *Preq:* AP EC 313, FIN 307, or consent of instructor.

420, 620 World Agricultural Trade 3(3,0)S Practical considerations of agricultural trade and trade policy analysis are reviewed. The role of international institutions is considered. Special emphasis is placed on concepts of agricultural trade, analysis of trade policies of major trading partners/competitors, and export/import marketing of products. *Preq:* AP EC 309, ECON 412, or consent of instructor.

425, 625 Aquaculture Economics 3(3,0)F Alternate years. Application of economics and business principles by firms engaged in fish farming. Basic microeconomic theory is reviewed and applied to aquacultural enterprises. Stress is given to financial management, investment analysis, and marketing management. Public policy affecting aquaculture is also discussed and international aquaculture development reviewed. *Preq:* AP EC 202 and 309 and W F B 350 or consent of instructor.

426, 626 (AGRON) Cropping Systems Analysis 3(2,2) See AGRON 426.

433, 633 Agricultural Law and Related Environmental Issues 3(3,0) Introduction to agricultural and agricultural-related environmental legal issues. Topics include a review of laws, agencies, programs, the court structure, torts, taxation, biotechnology, land and water use, regulated industry and environment liabilities as they relate to agriculture and natural resources. *Preq:* LAW 322 or consent of instructor.

452, H452, 652 Agricultural Policy 3(3,0)F Review of public agricultural policy programs in the United States and a critical examination of current and proposed government policies and programs affecting the agricultural sector of the economy. Included are economic considerations as related to past and current farm price and income problems. *Preq:* AP EC 302 and 309.

456, H456, 656 Prices 3(3,0)S Review of the basic theory of price under competitive conditions and various modifications; nature, measurement and causes of daily, seasonal and cyclical price fluctuations; geographical price relationships; nature, function and behavior of futures markets; government price programs. *Preq:* AP EC 308, ECON 314, EX ST 462.

460, 660 Agricultural Finance 3(3,0)S The study of the principles and technique of financing in the agricultural sector. Topics include the capital situation in agriculture, concepts of farm financial management, use of credit, capital markets, lending agencies, and estate planning. *Preq:* ACCT 200 or 201, AP EC 202.

490, 690 Selected Topics 1-15(0,2-30) Study of topics in applied economics. Topics may include classroom, and/or field experience not normally covered in other classes. May be repeated for credit, but only if a different topic is covered. *Preq:* Junior standing and/or consent of instructor.

491 (C R D) Internship, Agribusiness, and Community and Rural Development 1-6(0,2-12) See C R D 491.

719 Professional Problems in Agribusiness Management 3(3,0)

791 Selected Topics in Agricultural Economics 1-3(1-3,0)

802 Advanced Production Economics 3(3,0)

806 Community and Regional Economics 3(3,0)

807 Market Structure in Agricultural Industries 3(3,0)

808 Applied Quantifications in Agricultural Economics 3(3,0)

809 Advanced Natural Resource Economics 3(3,0)

810 Water and Marine Resources Management and Policy 3(3,0)

814 Contemporary Public Policy 3(3,0)

827 Advanced Agricultural Consumption and Demand 3(3,0)

851 Seminar in Research Methodology 1(1,0)

852 Research Methods for Agricultural Economists I 2(2,0)

853 Research Methods for Agricultural Economists II 3(3,0)

881 Internship in Community and Resource Development 1-6

891 Master's Research. Credit to be arranged.

901 (ECON) Price Theory 3(3,0)

902 (ECON) Production Economics Problems 2(2,0)

903 (ECON) General Equilibrium and Welfare Theory 3(3,0)

904 (ECON) Seminar in Resource Economics 3(3,0)

905 (ECON) Advanced Macro Issues 3(3,0)

906 (ECON) Seminar in Area Economic Development 3(3,0)

907 (ECON) Agricultural Marketing Problems 2(2,0)

917 (ECON) Advanced Seminar in Labor Economics 3(3,0)

991 (ECON) Doctoral Research. Credit to be arranged.

AGRICULTURAL EDUCATION (AG ED)

Professors: L. H. Blanton, J. H. Daniels, R. J. Mercer, W. A. Shimel, G. C. Shinn, *Head; Associate Professor:* J. G. Harper; *Assistant Professors:* R. L. Poling, C. D. White; *Visiting Instructor:* R. D. Lambert

100 Orientation and Field Experience 1(0,2)S Supervised observations and explanations of vocational agriculture teaching while serving as teacher aides. One full week of field experience in representative high schools is required.

101 University Success Skills 2(3,0) Along with improving study and learning skills and maximizing all resources available for university success, people and procedures are featured as examples of successful characteristics for academics and careers. Selected activities provide self-determined strengths and weaknesses with prescriptive action. Limited to students in their first two semesters at Clemson.

201 Introduction to Agricultural Education 3(2,3)F Principles of education, development of agricultural education, and an introduction to the formulation of instructional programs for the teaching of agricultural courses.

300 Supervised Field Experience I 1(0,3) Actual participation in vocational agriculture teaching activities plus conferences with local supervising teachers and college supervisors. One full week of field experiences in specialized high school programs or area vocational centers is required.

400 Supervised Field Experience II 1(0,3)F Special emphasis is placed on enhancing existing knowledge and experiences of the students. The primary focus will be on becoming acquainted with the student teaching center well in advance of the customary twelve-week directed teaching experience.

401, 601 Methods in Agricultural Education 3(2,3)F Appropriate methods of teaching vocational agriculture in high schools. The course includes procedures for organizing teaching programs, teaching high school students, and directing FFA activities.

403, 603 Principles of Adult/Extension Education 3(3,0) An overview of adult/extension education and adult learning. Selection of adult education providers will be reviewed with emphasis on extension. *Preq:* Junior standing or consent of instructor.

406 Directed Teaching 12(0,36)S Guided participation in the professional responsibilities of a teacher of vocational agriculture including an intensive study of the problems encountered and the competencies developed. Twelve weeks of directed teaching in selected schools are required. *Preq:* AG ED 400, 401.

407 Internship in Extension Education 6(0,18) Interest and needs of students enrolled

will be considered in placing agriculture majors and minors for practical experience. Internship placements may include county extension offices and other appropriate extension units. Six weeks of supervised experience must be completed. *Preq:* AG ED 400, senior standing, and consent of instructor at preregistration.

410, 610 History, Philosophy, and Future of the Land-Grant System 3(3,0) Provides a broad perspective of the American land-grant system. Major emphasis will examine assumptions and investigate the concepts, paradigms, issues, strategies, and programs of the system. Organizational structures, research methodologies, change processes, and adoption-diffusion strategies will also be examined. *Preq:* Junior standing or consent of instructor.

423, 623 Curriculum 2(2,0)S Curriculum goals and related planning for career and continuing education programs.

425, 625 Teaching Agricultural Mechanics 2(1,3)S Organizing course content, conducting and managing an agricultural mechanics laboratory, shop safety, microteaching demonstrations of psychomotor skills, and methods of teaching manipulative abilities.

428, 628 Special Studies in Agricultural Education 1-3(1-3,0) Students are provided with an opportunity to study individually or collectively selected topics and/or problems in agricultural education to meet the particular needs of the clientele enrolled. May be taken for a maximum of 6 semester hours credit.

431, 631 Methods in Environmental Education 3(3,0)SS Study of various techniques appropriate for teaching environmental education. Instruction is applicable to elementary, high school, and adult-level teachers. Offered in Summer School only.

432, 632 Visual Media for Agribusiness 3(2,3) Theoretical and practical course for professionals in agriculture with major emphasis on visual communications.

440, 640 Program Development in Adult/Extension Education 3(3,0) Principles, theory, and practice in planning and conducting educational programs in adult/extension settings. *Preq:* Junior standing or consent of instructor.

445, 645 Evaluation of Adult/Extension Education Programs 3(3,0) Philosophy and methodology of conducting evaluations of adult educational programs such as extension or adult continuing education programs. Emphasis will be on designing and conducting different types of program evaluations, including appropriate data collection methods. *Preq:* Junior standing or consent of instructor.

450, 650 Modern Topics and Issues 3(3,0) A major area of concern to teachers of agriculture and county agents will be selected for intensive study at least one semester prior to offering the course. Team teaching with faculty from other departments in the College of Agricultural Sciences will be utilized when feasible. *Preq:* Senior standing or relevant experience.

480, 680 (COLED, ED, IN ED) Educational Applications of Microcomputers 3(3,0) See COLED 480.

482, 682 (COLED, ED, IN ED) Advanced Educational Applications of Microcomputers 3 (2,2) See COLED 482.

726 Agricultural Mechanization for Inservice Teachers 3(3,0)

727 Agricultural Education Shop Management 3(1,6)

736 Internship: Teaching 3(1,6)

737 Internship in Agribusiness Firms 3(1,6)

750 Special Institute Course: Selected Topics in Agricultural Education 1-3(1-3,0)

801 Systems for Technology Transfer 3(3,0)

803 Evaluation of Instructional Programs 3(2,3)

804 Special Problems 3(2,3)

805 Administration and Supervision in Agricultural Education 3(3,0)

815 Teaching Agricultural and Power Mechanics 3(2,3)

821 Theories and Practices of Adult Education 3(3,0)

825 Supervision of Student Teaching 3(3,0)

869 Seminar 1-3(1-3,0)

889 (ED, IN ED) Research in Education 3(3,0)

AGRICULTURAL ENGINEERING (AG E)

Professors: W. H. Allen, D. E. Brune, J. M. Bunn, J. A. Collier, J. C. Hayes, R. O. Hegg, *Head;* C. E. Hood, Jr., J. T. Ligon, D. E. Linvill, R. K. White, R. E. Williamson, R. E. Young; *Associate Professors:* R. B. Dodd, Y. J. Han; *Instructor:* T. R. Garrett; *Lecturer:* R. G. Hammond

214 Fabrication and Manufacturing Methods for Agricultural Systems 2(1,3) Introduction to machine and structure fabrication for agricultural engineering related disciplines. Topics include metallurgy, arc and gas welding, fasteners, wood fabrication, plastics and protective coatings. *Preq:* E M 201. *Coreq:* E G 209.

221 Surveying for Soil and Water Resources 2(1,3) Fundamentals of land measurement and traverse computations. Surveying practice in traverse and topographic surveys preliminary to design of techniques and construction of structures for resource management. *Preq:* MTHSC 106.

322 Small Watershed Hydrology and Sedimentology 2(1,3) Fundamental relationships governing rainfall disposition are used as bases for defining the hydrology of watersheds. Application of modeling techniques appropriate for runoff and sediment control are emphasized. *Preq:* PHYS 122. *Coreq:* AGRON 202.

333 Environmental Modification and Control for Agricultural and Biological Systems 2(2,0) Principles of environmental modification and control including energy exchange, psychrometrics, heat and moisture balance, biological interactions, control systems and basic elements of heating, ventilation and air conditioning are presented. *Preq:* Junior standing.

350, H350 Microcomputer Controls in Biosystems 2(1,3) Microcomputer interfacing and digital control are studied for application to agriculture, aquaculture, biotechnology and other biosystems. Topics include digital electronic circuits and components, microcomputer architecture and interfacing. *Preq:* E C E 307, ENGR 180, MTHSC 208.

356 Machine Operations for Agricultural and Biological Systems 3(2,3) Concepts of machine operations and machine systems for agricultural and biological applications. Selection, performance evaluation, economic analysis, and maintenance management for individual machines and machine systems. Computer applications for analyzing machine costs and other management factors. *Preq:* E M 201 or PHYS 122.

362, H362 Energy Conversion in Agricultural and Biological Systems 3(2,3) The energy requirements of biological and agricultural systems with emphasis upon direct energy conversion methods. Characteristics of various sources of energy will be considered including economic aspects. The present energy conversion mechanisms used in agriculture will be studied and their limitations presented. *Preq:* M E 310.

364 Agricultural Waste-Management Systems 2(2,0) The course will include planning and design of waste-management systems which employ physical, biological, and chemical processes for the treatment and utilizations of agricultural wastes. Solid, liquid, and gaseous wastes are considered. Presentation is relevant to current agricultural practices and legal and social restraints.

408, 608 (AGRON, E S E) Land Treatment of Wastewater and Sludges 3(3,0) See AGRON 408.

416, H416, 616 Mechanical Design for Agricultural and Biological Systems 3(2,3) Fundamentals of mechanical design with applications to machinery functions relating to soil, plants, and biological products. A design project is performed. *Preq:* E M 304.

421, 621 Engineering Systems for Soil Water Management 2(1,3) Fundamentals of design related to drainage of lands, irrigation and modification of the microenvironment for optimum productivity are presented. *Preq:* MTHSC 208. *Coreq:* E M 320.

428, 628 (CH E) Biochemical Engineering 3(3,0) See CH E 428.

429 Applications in Biotechnology Engineering 3(2,3) Biological growth kinetics and re-

actor kinetics are applied to demonstrate the principles of ethanol production, cellulose conversion, and anaerobic processes. Integration of food production processes and waste treatment fundamentals of modeling biological processes are studied. Specific biotechnical applications such as plant tissue culture, advances in biosensor and biomechanical systems are analyzed. *Preq:* CH E (AG E) 428.

430, 630 (BIOSC) Engineering Modeling of Biological Systems 3(3,0) Examination of the principal mechanisms of energy capture and transformation in living organisms. Quantitative models of energetic reactions and associated transport processes are developed according to the principles of equilibrium and nonequilibrium thermodynamics. Topics include basic cell biology, photosynthesis, respiration, chemosmotic theory, electron transport, mass and energy transport phenomena. *Preq:* BIOCH 301, MTHSC 208 or consent of instructor. *Coreq:* M E 310 or instruction in thermodynamics.

431, 631 Agricultural Structures and Environmental Design 3(2,3) Analytic design of statically determinant building components with emphasis on wood, steel, and concrete. Specific heating ventilation and air-conditioning systems for animal production are designed. *Preq:* E M 304.

442, 642 Properties and Processing of Biological Products 3(2,3) Study of engineering properties of biological materials and their uniqueness as design restraints on systems for handling, processing and preserving biological products. *Preq:* AG E 333, E M 304, 320, M E 310.

450, H450, 650 Instrumentation for Agricultural and Biological Systems 3(2,3) Overview of modern instrumentation techniques in agricultural and biological engineering systems. Emphasis is on laboratory use of equipment. Topics include performance characteristics of instruments, analog-signal conditioning, transducer theory and applications, and digital systems for data acquisition and control. *Preq:* AG E 350, familiarity with computer programming, or consent of instructor.

451, H451, 651 (E S E, FOR) Newman Seminar and Lecture Series in Natural Resources Engineering 1(0,2) Topics dealing with the development and protection of land, air water, and related resources will be covered by seminar with instructor and by invited lecturers. Current environmental and/or resource conservation issues will be addressed. *Preq:* Senior or graduate standing, consent of instructor.

458, H458, 658 (BIOSC) Cell Physiology 3(3,0) See BIOSC 458.

471 Engineering Research and Management 2(1,3) A research project is conducted on an agricultural and biological engineering problem. Engineering economics, engineering creativity and project management are incorporated in addition to communications skills. *Preq:* Senior standing in Agricultural Engineering or other engineering curricula.

473 Special Topics in Agricultural Engineering 1-3(1-3,0) Comprehensive study of special topics in the field of agricultural engineering not covered in other courses. Special emphasis will be placed on independent pursuit of detailed investigations. May be repeated for a maximum of 6 credits, but only if different topics are covered.

484, 684 (E S E, I E) Municipal Solid Waste Management 3(3,0) See E S E 484.

781 Special Problems 1-3

811 Tillage and Soil Dynamics 3(3,0)

822 Water Movement in Soils 3(3,0)

865 Heat and Moisture Transfer in Biological Materials 3(3,0)

871 Selected Topics in Agricultural Engineering 1-3

882 Systems Engineering 3(3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

AGRICULTURAL MECHANIZATION (AG M)

Professors: W. H. Allen, D. E. Brune, J. M. Bunn, J. A. Collier, J. C. Hayes, R. O. Hegg, C. E. Hood, Jr., J. T. Ligon, D. E. Linvill, R. K. White, R. E. Williamson, R. E. Young; *Associate Professors:* R. B. Dodd, Y. J. Han, J. G. Harper; *Instructor:* T. R. Garrett; *Lecturer:* R. G. Hammond

101 Introduction to Agricultural Mechanization and Business 1(0,3) Introduction to Agricultural Mechanization and Business program. An overview of the curriculum will be given and the opportunities for extracurricular activities explained. Long-term interaction between the department and alumni will be covered.

205 Principles of Farm Shop 3(2,3) Principles, techniques, and methods in the selection, proper use and maintenance of hand and power tools. Principal topics include welding, tool fitting, metalworking, woodworking, finishing and preserving, pipe fitting, and farm masonry.

206 Agricultural Mechanization 3(2,3) The agricultural student is taught to apply physical principles and sound reasoning to the mechanization of modern agricultural production and processing enterprises. Planning efficient operational systems and wise selection of equipment, based on function and economic suitability are stressed. *Preq:* MTHSC 105, PHYS 207 or consent of instructor.

301 Soil and Water Conservation 3(2,3) Water management in agriculture is studied by applying principles of elementary surveying, mathematics, and fluid flow as related to soil-water-vegetation complexes in erosion control, water conservation, drainage, and irrigation.

302 Rainfall, Runoff, and Erosion Control 3(2,3) Precipitation causes, characteristics, and distribution are covered. Resulting runoff rates and volumes as influenced by watershed characteristics are studied, including methods of controlling runoff and erosion by vegetative and mechanical means. Sufficient elementary surveying is included to assure proper application of principles in the design of soil and water conservation practices. Not open to students who have completed AG M 301.

303 Calculations for Mechanzied Agriculture 3(2,3) Course designed to enhance the student's ability to analyze and solve a wide range of problems requiring engineering technology. Laboratory periods will be used to introduce the student to microcomputer hardware. Basic programming and typical applications to agricultural mechanization problems are included. *Preq:* PHYS 207 or consent of instructor.

401, 601 Environmental Control for Plants and Animals 1(1,0) Basic concepts of environmental control for plant and animal production and human housing are presented. Elements include heat transfer, psychrometry, heating, cooling, ventilation, and heat/moisture balances. *Preq:* PHYS 200 or consent of instructor.

402, 602 Drainage, Irrigation, and Waste Management 3(2,3) Continuation of AG M 302. Basic soil-water-plant relationships are used to determine the need for and methods of irrigation, drainage, and waste management. Topics covered will include irrigation methods, drainage needs, drainage methods, and waste-treatment methods. *Preq:* AG M 302.

403, 603 Structures for Plants and Animals 2(1,3) Structures for agricultural production systems are planned and designed with regard to function, materials, loads and component sizing, utilizing the approach of an engineering or construction technologist. *Preq:* PHYS 200 or consent of instructor.

406, 606 Mechanical and Hydraulic Systems 3(2,3) This course deals with power transmission systems for agricultural production with emphasis on mobile equipment. The characteristics, requirements, and design of both V-belt drive and roller-chain drives are presented. Emphasis is placed on hydraulic power transmission systems, including pumps, actuators, control devices, and hydraulic circuitry. *Preq:* AG M 206, PHYS 207 or consent of instructor.

408 Equipment Sales and Service 3(3,0) Agricultural equipment sales and service techniques, inventory and accounting procedures followed by the farm machinery industry.

452, 652 Farm Power 3(2,3) A study of tractors with emphasis upon internal combus-

tion engines and the support systems necessary for their proper functioning. The application of power, maintenance, adjustment, and general repair are also considered. *Preq:* PHYS 207 or consent of instructor.

460, 660 Farm and Home Utilities 3(2,3) A course for undergraduate and graduate students in agriculture and related curricula, involving a study of electric and other utilities on the farm and in the home. Selection, installation, and maintenance of wiring systems, lighting systems, motors, controls, water systems, and waste disposal systems are emphasized. *Preq:* PHYS 208 or consent of instructor, Junior standing.

472 Seminar 1(1,0) The student will be introduced to the agribusiness world, professionalism, current topics of special interest, and financial and legal implications of modern agricultural production. *Preq:* Senior standing in Agricultural Mechanization and Business or consent of instructor.

473 Special Topics in Agricultural Mechanization 1-3(1-3,0) Comprehensive study and application of new technologies and methods not covered in existing courses. Emphasis is placed on independent study using innovative approaches to problem solving. May be repeated for a maximum of 6 credits. *Preq:* Consent of instructor.

712 Farm Machinery Management 3(2,3)

771 Selected Topics in Agricultural Mechanization 1-3(1-3,0)

781 Special Problems 1-3(1-3,0)

AGRICULTURE (AGRIC)

Professors: L. L. Bauer, G. L. Bradford, O. J. Dickerson, J. R. Diehl, R. E. Franklin, R. G. Halfacre, H. S. Hill, Jr., L. W. Hudson, D. E. Linvill, J. C. McConnell, Jr., E. L. McLean, R. J. Mercer, G. C. Shinn, S. U. Wallace, G. J. Wells; *Associate Professors:* P. A. Skewes, M. E. Richardson, J. G. Harper; *Assistant Professor:* M. Hall, C. D. White

103 Introduction to Animal Industries 3(3,0)F Fundamental and descriptive aspects of the animal industries as applied biology and major segments of food production and distribution systems. The subject matter will be presented by Animal Science, Dairy Science, and Poultry Science Departments.

104, H104 Introduction to Plant Sciences 3(3,0)S A fundamental course in plant sciences, including agronomic and horticultural crops of the major agricultural areas of the world and emphasizing the crops of South Carolina.

105 Agriculture and Society 3(3,0) Examination of the structure, function, and importance of the food and resource base, production, supply, marketing, demand, capital, labor markets, and consumption behavior in the U.S. economic and sociological issues affecting U.S. agriculture.

200 Agricultural Applications of Microcomputers 3(2,2) Provides an overview of microcomputer hardware and software encompassing wordprocessing, spreadsheet, data base management, utility, and graphic communications. It also includes specialized farm and agribusiness management and decision-making programs and criteria for evaluating and selecting hardware.

301 International Agriculture 3(3,0) Designed to acquaint the student with the systems of agriculture of the world. The approach is evolutionary. Main emphasis is on production as related to world climates and world population. Various geographical areas are considered. *Preq:* AP EC 202 or ECON 211.

401 International Agriculture Seminar 1(1,0)S A colloquium of current issues in world agriculture. Topics include population growth, food policy, technology transfer, and international trade. With consent of instructor, the course may be repeated for a total of 2 credits.

440, 640 Microclimatology 3(3,0) Study of energy balance in earth's atmosphere and soil: solar and thermal radiation, air and soil temperature, humidity, evaporation and the hydrologic cycle, wind fields. Weather variables to describe microclimates and the energy balance of plants, animals, and insects. Modification of microclimates. Rural and urban climates. *Preq:* PHYS 240 or equivalent or consent of instructor; second semester Junior or Senior standing.

H491 Senior Honors Research 3(1,6) Senior Division Honors research in an agricultural sciences curriculum. Open to approved Honors Program students only. In consultation with and under the direction of a professor, the student will select a research topic, conduct experiments, record data, and make an oral presentation of results to the College Honors Program Committee.

H492 Senior Honors Research 3(1,6) Continuation of AGRIC H491. Senior division honors research in an agricultural sciences curriculum. Upon termination of the research project, the student will submit a formal written report and make a final oral presentation of results to the College Honors Program Committee. Professor-student discussions of additional topics will be arranged.

AGRONOMY (AGRON)

Professors: S. R. Chapman, R. E. Franklin, *Head;* B. J. Gossett, W. D. Graham, Jr., J. A. Martini, J. H. Palmer, V. L. Quisenberry, J. S. Rice, E. R. Shipe, H. D. Skipper, B. R. Smith, S. U. Wallace, T. Whitwell; *Associate Professors:* B. W. Pinkerton, H. T. Skorupska, W. C. Stringer; *Assistant Professor:* N. W. Ferguson

202 Soils 4(3,2)F,S Introduction to world land resources, soil formation, classification, and mineralogy. Emphasis is placed on the basic chemical and physical properties of soil. Soil microorganisms, plant nutrients, and fertilization are discussed. Soil properties are related to growth. *Preq:* CH 101, 102 or a geology sequence including GEOL 101, or consent of instructor.

350 Practicum 1-3 Preplanned internship undertaken with an approved agency concerned with agronomic practices. Restricted to students with a major or minor in Agronomy. Maximum of 3 credits allowed. *Preq:* Consent of department head.

403, 603 Soil Genesis and Classification 2(1,3)F Study of soil morphology and characterization, pedogenic processes, soil-forming factors, and classification of soils. *Preq:* AGRON 202 or consent of instructor.

404, 604 Soils and Land Use 2(1,3)F Soils interpretations for nonagricultural purposes and facilities. Emphasis on use of modern soil surveys and properties and features of soils important in nonfarm land uses. Not open to Agronomy majors or minors or to students who have taken AGRON 202.

405, 605 Plant Breeding 3(2,2)S The application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant breeding, mode of reproducton, techniques in selfing and crossing, methods of breeding, inheritance in the major crops, and biometrical methods. *Preq:* GEN 302 or equivalent.

406 Special Problems 1-3(0,3-9) Course designed to acquaint undergraduate students with the scientific method. Literature investigation, planning, and execution of an experiment are integral parts of the course. Not available to AGRIC H491 and H492 students. Maximum of 6 credits allowed. *Preq:* Senior standing as a major or minor in Agronomy and consent of department head.

407, H407, 607 Weed Ecology and Management 3(2,2) Weeds, their introduction, ecology, methods of reproduction, dissemination, and management; chemistry and mode of action of herbicides, equipment and techniques of application; and a characterization of the common weeds of the Southeast. *Preq:* AGRIC 104, AGRON 202, or consent of instructor.

408, 608 (AG E, E S E) Land Treatment of Wastewater and Sludges 3(3,0)S Principles for designing environmentally acceptable land application systems using municipal and industrial wastewater and sludges will be presented. Topics include land-limiting constituent analysis; soil-plant interactions; system equipment and design; system operation and management; public acceptance, social, and regulatory issues. Case studies and field trip(s) are planned. *Preq:* Senior standing in Agriculture or Engineering or consent of instructor.

421, 621 Field Crops—Monocots and Specialty Crops 3(3,0)F The principles involved in the production and utilization of corn, wheat, oats, barley, rye, sorghum, rice, and the millets, with special emphasis on their importance in South Carolina agriculture. The role of other oil, fiber, seed, drug, sugar, and other crops will be treated from the

standpoint of worldwide production and utilization. *Preq:* AGRIC 104, AGRON 202.

422, 622 Field Crops—Dicots 3(3,0)S The principles involved in the production and utilization of corn, soybeans, tobacco, and peanuts with special emphasis on their importance in South Carolina agriculture. *Preq:* AGRIC 104, AGRON 202.

423, H423, 623 Field Crops—Forages 3(3,0)S The characteristics, establishment, utilization, and maintenance of crops for hay, silage, and pasture. Crops valuable in South Carolina are emphasized. Admission to Honors section by invitation only. *Preq:* AGRIC 104, AGRON 202, or consent of instructor.

425, 625 Seed Science and Technology 3(2,2)S Odd-numbered years. Topics include seed development, germination, dormancy, pathology, storage, and deterioration. Seed testing and commercial production of seed are also covered. Emphasis will be placed on useful applications of current seed science knowledge. *Preq:* AGRIC 104, BOT 205.

426, 626 (AP EC) Cropping Systems Analysis 3(2,2)F Application of agronomic and economic principles in solving problems relating to the production and marketing of agronomic crops. A major part of the course will be a case study in which a detailed analysis of a farm, agribusiness or environmental will be made with students making formal written and oral presentations of results. *Preq:* AP EC 202, AGRIC 104, Junior or Senior standing.

433, 633 (HORT) Integrated Weed Management for Agronomic and Horticultural Crops 3(2,2) See HORT 433.

446, 646 Soil Management 3(3,0)F Basic soil properties are related to compaction, water and solute movement, and root growth. Practical management problems are considered and solutions developed based upon basic soil characteristics. Problems will include erosion, no-tillage, compaction, irrigation, leaching, waste application, golf-green management, and orchard establishment. *Preq:* AGRON 202.

452, 652 Soil Fertility and Management 3(3,0)S Soil properties, climatic factors, and management systems in relation to soil fertility maintenance for crop production. Plant nutrition and growth in relation to crop fertilization and management. *Preq:* AGRON 202 or consent of instructor.

453, H453, 653 Soil Fertility Laboratory 1(0,3)S The evaluation and interpretation of soil fertility production. *Preq:* AGRON 202 or consent of instructor.

455 Seminar 1(1,0)F Student presentation of current agronomic topics of special interest in crop production appearing in recent scientific journals and other publications.

475, H475, 675 Soil Physics and Chemistry 3(2,3)S Study of the principles of soil physics and chemistry and their applications. Topics include soil texture, structure, compaction, water relations, solute movement, mineral composition, adsorption phenomenon, and soil acidity. *Preq:* AGRON 202, CH 101, 112, PHYS 207.

490, 690 Soil Organisms in Crop Production 3(2,3)S Even-numbered years. Interrelationships of soil organisms, soil properties, and crop production. Aspects of biological nitrogen fixation, mycorrhizae, and microbial pesticide interactions. Biochemical and nutrient transformations related to plant growth. *Preq:* AGRON 202, MICRO 305, PL PA 401, or consent of instructor.

701 Soils and Man 3(3,0)

710 Selected Topics in Plant Biotechnology 3(2,2)

801 Crop Physiology and Nutrition 3(3,0)

802 Pedology 3(3,0)

804 Theory and Methods of Plant Breeding 3(3,0)

805 Soil Fertility 3(3,0)

806 Special Problems 1-3(0,3-9)

807 Soil Physics 4(3,3)

808 Soil Chemistry 3(2,3)

810 Soil Microbiology 3(3,0)

812 Crop Ecology and Land Use 3(3,0)

820 Pesticide Residues in the Environment 3(3,0)

825 Seminar 1(1,0)

890 Special Topics in Agronomy 1-3(1-3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

ANIMAL, DAIRY AND VETERINARY SCIENCES (ADVSC)

Professors: A. B. Bodine II, D. L. Cross, J. F. Dickey, J. R. Diehl, C. W. Foley, *Head;* T. Gimenez, D. M. Henricks, L. W. Hudson, J. C. McConnell, Jr., G. C. Skelley, Jr., J. C. Spitzer, C. E. Thompson; *Associate Professors:* J. A. Bertrand, T. C. Jenkins, M. E. Richardson; *Assistant Professor:* A. K. Greene; *Instructor:* M. M. Richardson

100 Orientation to Animal, Dairy and Veterinary Sciences 1(2,0)F Study of the role of animal agriculture in the world today with emphasis on supply and demand of end products and careers available in the animal industry.

101 Dairy Foods 1(1,0) Production aspects of dairy foods from the farmer to the consumer including in such products as ice cream, yogurt, and various cheeses; the use of these foods for nutrition and pleasure. Students who have received credit for ADVSC 307 will not be allowed to enroll in or receive credit for ADVSC 101.

102 Mammalian Reproduction 1(1,0) Physiology and endocrinology of the reproductive processes in male and female mammals with emphasis on farm animals. Control of reproductive cycles, diseases, sexuality, and effects of drugs on reproduction will be discussed.

108 Animal and Dairy Science Techniques 1(0,2)S Basic principles in the handling of livestock and techniques of animal industries are discussed. Basics of animal anatomy, and equipment and facilities used in animal production are presented.

202 Introductory Animal Sciences 3(3,0)F Systematic coverage of the basic principles involved in breeding, feeding, management, and product marketing in beef and dairy cattle, swine, sheep, and horse operations.

203 Dairy Science Techniques 1(0,2)F Laboratories designed to demonstrate the basics of breeding, feeding, and management of dairy cattle, quality control of milk, and processing of milk and dairy products. *Preq:* ADVSC 108.

205 Light Horse Management 2(1,3)F The light horse industry—development of breeds and their uses. Breeding, feeding, and management of light horses. Fundamental instruction in equitation.

210 Animal Science Techniques 1(0,2)F Livestock handling techniques used in the animal industry are discussed. Principles of animal care and management for livestock production are emphasized. *Preq:* ADVSC 108.

253 Meats 2(2,0)S Study of the chemical and physical composition of meat, meat hygiene, nutritive value, curing, freezing, and meat by-products. *Preq:* ADVSC 108 and 202.

255 Meats Laboratory 1(0,3) The selection and grading of meat animals and carcasses. Practical work in slaughtering of animals and in the cutting, curing, and freezing of meats. Emphasis is placed on the identification of wholesale and retail cuts. *Preq:* ADVSC 108 and 202.

301, H301 Feeds and Nutrition 3(3,0)S Designed to familiarize the student with nutrients and feeds used in livestock and specialty animal production. Methods of evaluating common feedstuffs is covered along with a survey of the functioning of the various digestive systems. Practical aspect to feeding each species is covered. *Preq:* ADVSC 202, CH 101 and 102.

302 Principles of Livestock Selection 2(1,2)S Pedigrees, performance records, and visual appraisal techniques will be integrated to teach students to identify livestock to be kept for breeding purposes. Students enrolled in the course are eligible to compete in intercollegiate selection contests.

303 Livestock Evaluation 2(1,2)F Modern selection parameters are integrated with vis-

ual appraisal in the identification of body traits that will ultimately affect the market grades and economic value of live animals and their carcasses.

304 Evaluation of Dairy Products 2(1,2)S Emphasis placed on sensory evaluation of dairy products. Discussion of basic principles of organoleptic evaluation, fundamental rules for scoring and grading dairy products. Evaluation of all classes of dairy products, based on established grades and score cards.

305 Meat Grading and Selection 2(1,2)S Classification, grading, and selection of beef, lamb, and pork carcasses, and wholesale cuts; and factors influencing quality and value will be studied. Students in this course are eligible to compete in intercollegiate meat-judging contests.

306 Feeds and Nutrition Laboratory 1(0,2)S Students learn procedures for formulating diets that meet nutrient requirements of livestock and poultry, utilizing traditional mathematical approaches and computerized formulation. Computerized least-cost formulation of diets is covered along with familiarization with feeding systems and approaches. *Preq:* ADVSC 202 and to be taken concurrently or to follow ADVSC 301.

307 Fluid Milk 4(3,3)F Composition, procurement, processing, distribution, quality control, public health aspects, basic chemistry and microbiology of fluid milk supplies and products. *Preq:* BIOL 103, 104, CH 101, 102.

309 Principles of Equine Evaluation 2(0,4) Study of conformation as it relates to locomotion, soundness, and breed standards are taught. Included are the rules and regulations of performance events and appropriate management of these events. Considerable time will be spent judging classes and delivering oral reasons.

310 Animal Disease and Sanitation 3(3,0)S Basic principles of animal health. The course emphasizes disease prevention in beef cattle, dairy cattle, goats, horses, poultry, and swine. The most common and important diseases and zoonosis of farm animals are explained. *Preq:* ADVSC 202.

311 Dairy Cattle Selection 2(1,2)S Emphasis is placed on the selection of dairy cattle for profitable herd operations. Evaluation of herd classification, fitting, showing and true types are made.

360 Internship 1-12(0,3-36) An off-campus, preplanned, supervised learning opportunity in an area related to animal, dairy or veterinary science. Students will submit periodic written reports and a final written report. To be taken Pass/Fail only. Limited to Animal, Dairy and Veterinary Sciences majors. *Preq:* Sophomore standing and consent of specific instructor coordinating the internship.

380 Muscle Growth and Meat Fabrication 3(2,2)F Histology, biochemistry, and physiology of animal muscle, fat and bone tissue with laboratory emphasis on sausages and restructed meat products. *Preq:* ADVSC 202, 253, 255.

390 Practicum 1-3(0,3-9) An on-campus, preplanned, supervised learning experience in an area related to animal, dairy and veterinary sciences. Course will give experience not covered in other classwork. May be repeated for a maximum of 4 credits. *Preq:* Consent of specific instructor supervising practicum experience.

400, 600 Dairy Processing I 4(3,3)S Alternate years. Basic principles and operation of dairy processing equipment used to manufacture a variety of dairy products and the basic principles of management needed to control the quality of these products. The efficient organization and operation of food and dairy plants. *Preq:* ADVSC 307 and PHYS 200.

401, H401, 601 Beef Production 4(3,2)F Breeding, feeding, reproduction and management of beef cattle will be discussed. Emphasis is on production systems integrating disciplines of animal agriculture into management plans and alternatives. Practical applications of beef production and management practices will also be presented. *Preq:* ADVSC 202, 301.

402, 602 Dairy Processing II 4(3,3)F Alternate years. Principles and practices used in the manufacture of cultured dairy products and frozen dairy products. Processing procedures, quality control, ingredients, formulations, and compositional and organoleptic characteristics of cultured and frozen dairy products will be discussed. *Preq:* ADVSC 307, 400, PHYS 200.

403, 603 Laboratory Techniques 3(2,3)F Research and quality control techniques commonly used in dairy science and related agri-sciences. *Preq:* CH 101, 102.

404, 604 Dairy Cattle Feeding and Management 4(3,2)S Alternate years. Fundamental principles in the care, feeding, and management of dairy cattle of all ages. Topics include general consideration in selecting a breed and the individual cow, calf raising, growth and development of dairy heifers, care and maintenance of the milking herd, and feeding for milk production. *Preq:* ADVSC 202 and 301.

405 Advanced Selection and Evaluation 2(0,4)F Class intended to provide special and advanced training in selection and evaluation of breeding, performance, and market animals or their products. Species used are beef and dairy cattle, sheep, swine, and horses. *Preq:* ADVSC 302 or 303 or 304 or 305, 309 or 311 and consent of instructor.

406 Seminars and Related Topics 2(2,0)F Designed to provide opportunity to prepare and deliver orally, technical information not fully covered in classwork, to aid in resume preparation, to introduce interviewing skills, and to acquaint students with industry expectations for animal, dairy and veterinary sciences graduates. *Preq:* SPCH 250.

408, H408, 608 Pork Production 4(3,2)S Breeding, feeding, grading, marketing, and management of swine will be studied. Practical applications from all phases of the production cycle will be outlined in problem form to develop the student's problem-solving ability. *Preq:* ADVSC 202 and 301.

409 Selected Topics 1-3(1-3,0) Comprehensive study of selected topics in animal, dairy and veterinary sciences not covered in other courses. May be repeated a maximum of 6 credits, but only if a different topic is covered.

412, H412 Horse Production 4(3,2)S Feeding, breeding, and management of the horse discussed in relation to health, genetics, reproduction, nutrition, and selection. *Preq:* ADVSC 202 and 301.

422 Special Problems 1-3(0,3-9) Laboratory, library, or field study of problems related to animal, dairy and veterinary sciences, emphasizing development and testing of hypothesis and reporting of results. May be repeated for a maximum of 4 credits. *Preq:* Junior standing and consent of specific instructor supervising the study.

452, H452, 652 Animal Breeding 3(3,0)S The fundamental principles relating to the breeding and improvement of livestock including variation, heredity, selection, linebreeding, inbreeding, crossbreeding, and other related subjects. *Preq:* ADVSC 202 and GEN 302.

453, H453, 653 Animal Reproduction 3(2,2)S Reproductive physiology and endocrinology of mammals with emphasis on farm animals and frequent reference to reproduction in laboratory animals and humans. *Preq:* ADVSC 202 and AN PH 301.

455, 655 Animal Reproductive Management 1(0,3)S Physiology and endocrinology of pregnant and nonpregnant cows are discussed. Emphasis is placed on methods of artificial insemination, pregnancy detection, and computer recordkeeping for achieving a high level of reproductive efficiency in cattle. *Preq:* ADVSC 202, AN PH 301, and to be taken concurrently or to follow ADVSC 453.

461, 661 Physiology of Lactation 2(2,0)S Anatomy and development of the mammary gland; physiological and biochemical regulation of mammary growth and milk secretion with emphasis on farm animals and reference to other mammals. *Preq:* ADVSC 202 and BIOCH 210.

801 Selected Topics 1-3(1-3,0)

802 Meat Technology 3(3,0)

803 Physiology of Reproduction and Milk Secretion 3(3,0)

804 Methods in Animal Breeding 3(3,0)

805 Nutrition of Meat Animals 3(3,0)

808 Industrial Dairy Science 3(3,0)

820 Animal, Dairy and Veterinary Sciences Graduate Seminar 1(1,0)

891 Master's Research. Credit to be arranged.

ANIMAL PHYSIOLOGY (AN PH)

(See courses listed under Animal, Dairy, and Veterinary Sciences; Entomology; Poultry Science; and Zoology)

Professors: G. P. Birrenkott, Jr., J. F. Dickey, J. R. Diehl, T. Gimenez, B. Glick, D. M. Henricks, B. L. Hughes, R. J. Kendall, R. Noblet, J. C. Spitzer, R. J. Thurston, J. R. Tomasso, Jr.; *Associate Professors:* J. M. Colacino, M. E. Richardson, T. R. Scott

301 Physiology and Anatomy of Domestic Animals 4(3,3)F Physiology and associated anatomy of the body systems, including nervous, skeletal, muscular, respiratory, digestive, circulatory, urinary, reproductive, and endocrine systems. Designed primarily for students in Animal Science, Dairy Science, and Poultry Science. *Preq:* BIOL 103, 104 or 110, 111.

460, H460, 660 Systems Physiology 1(1,0)F Physiology of the digestive and endocrine systems. *Coreq:* ZOOL 459 or consent of instructor.

801 (BIOSC) Electron Microscopy of Biological Specimens 3(1,6)

802 Special Topics in Animal Physiology 1(1,0)

806 Care and Use of Research Animals 3(1,6)

807 Special Problems in Animal Physiology 1-3

808 Mammalian and Avian Endocrinology 3(3,0)

812 Digestive-Metabolic, Excretory and Respiratory Physiology 5(4,3)

814 Membrane, Cardiovascular and Neuro-Muscular Physiology 5(4,3)

851 Animal Physiology Seminar 1(1,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

ANTHROPOLOGY (ANTH)

Associate Professor: J. M. Coggeshall

201 Introduction to Anthropology 3(3,0) Humans as biosocial animals, including the theory of evolution and the archaeological evidence of physical and cultural development; emphasis on the relation of human beings to the environment.

251 Physical Anthropology 3(3,0) Study of humans as biological organisms. Examines human evolution, including current controversies; primate social behavior and relationships to humans; and racial and physiological differences among contemporary human populations.

301 Cultural Anthropology 3(3,0) The nature of human culture; the constants and variants in human behavior affecting technology, social relations, social control, family systems, language, religion and art. *Preq:* ANTH 201 or consent of instructor.

310 Archaeology of the Southeastern American Indians 3(3,0) The cultural prehistory of the Southeastern United States, including developments in each time period; evidence of intra- and inter-regional trade, agriculture, and societal complexity. *Preq:* ANTH 201 or consent of instructor.

320 North American Indian Cultures 3(3,0) American Indian ethnography, using the culture area approach in studying adaptations of native peoples; includes a brief survey of American Indians today. *Preq:* ANTH 201 or consent of instructor.

ARCHITECTURE (CA AR)

Professors: J. F. Barker, D. L. Collins, L. G. Craig, M. A. Davis, T. K. Doruk, C. Fera, J. D. Jacques, *Head;* Y. Kishimoto, P. R. Lee, R. B. Norman, G. B. Witherspoon; *Associate Professors:* D. J. Allison, H. A. Burton, R. D. Eflin, H. C. Harritos, R. J. Hogan, N. J. Hurt, D. J. Hutton, G. W. Patterson; *Assistant Professors:* R. D. Crout, Jr., R. T. Huff, M. H. Rice, T. C. Sammons, R. T. Silance; *Visiting Professors:* B. Doruk, H. E. McClure, J. L. Young; *Visiting Associate Professor:* R. J. Miller; *Visiting Assistant Professors:* P. Harwood, R. K. McGill, W. K. Powers, J. Wilkerson; *Visiting Instructors:* M. D. Alexander, R. C. Lowrey, W. S. Murff, W. S. Taberson

201 The Art of Architecture 3(0,6) Examines basic concepts of architectural design from historical models to contemporary examples. Seminar discussions complement studio exercises and projects which concentrate on principles of design, materials of construction, programmatic concerns, and design theories. *Preq:* CA DS 151 and 153; 152 and 154.

202 Art with Architecture 3(0,6) Course will emphasize the integration of art with architecture. Seminar discussions and field trips examine key examples from the past and present. Studio projects and exercises utilize the principles of design to creatively solve design problems of art in public places. *Preq:* CA AR 201.

251 Design Studies III 5(0,10) Studio work with adjunct demonstrations and lectures concerned with basic architectural design problems. *Preq:* CA DS 152. *Coreq:* CA AR 253.

252 Design Studies IV 5(0,10) Continuation of CA AR 251. *Preq:* CA AR 251. *Coreq:* CA AR 254.

253 Design Theory III 1(1,0) Introduction to fundamental ideas and issues of architecture through the presentation of topics on theory, technology, and practice.

254 Design Theory IV 1(1,0) Continuation of CA AR 253.

351 Design Studies V 5(0,10) Studio work with adjunct demonstrations and lecturers concerned with intermediate architectural design problems. *Preq:* CA AR 252. *Coreq:* CA AR 353.

352 Design Studies VI 5(0,10) Continuation of CA AR 351. *Preq:* CA AR 351. *Coreq:* CA AR 354.

353 Design Theory V 1(1,0) Continued study of ideas and issues of architecture through the presentation of topics on theory, technology, and practice.

354 Design Theory VI 1(1,0) Continuation of CA AR 353.

403, 603 The Modern Architectural Movement 3(3,0) Seminar in the analysis and criticism of architectural and town building works. The course sequence will include historic and contemporary examples, literary searches, field trips, essays, and oral reports. *Preq:* Senior standing or consent of instructor.

404, 604 Current Directions in Architecture 3(3,0) The critical analysis of the development and current directions of modern movements in architecture. *Preq:* Senior standing or consent of instructor.

405, 605 American Architectural Styles 1650-1950 3(3,0) Survey of American architectural styles and of the architects responsible for them, from the Colonial period to our recent past. Considerable emphasis will be placed on identifying those architectural elements which serve as clues in determining a building's architectural style.

412, 612 Architectural History Research 3(3,0) Directed investigations related to the art and architectural heritage of Italy.

414, 614 Design Seminar 3(3,0) Exploration of topical issues in architecture, art, construction, and planning.

416, 616 Field Studies in Architecture and Related Arts 3(0,9) Documentation and analysis of architectural structures observed during European travels in graphic and written form.

421 Architectural Seminar 3(3,0) Lectures and seminars dealing with pertinent topics related to environmental and technological considerations in architecture and the building industry. *Preq:* Senior standing or consent of instructor.

422 New Directions Seminar 3(3,0) Exploration into careers which relate directly (i.e., construction law) or indirectly (i.e., public relations) to the making of our built environment.

424, 624 Product Design 3(0,9) Furniture and product system design with emphasis on ergonomics and the relationship of form and materials. *Preq:* Senior standing and consent of instructor.

425, 625 Energy in Architecture 3(3,0) Climate design methodology and its influence on building energy patterns and architectural form. *Preq:* Senior standing and consent

of instructor.

426, 626 Architectural Color Graphics 3(2,3) Architectural color graphics by computer. Theories of color classification and interaction; application of color theories to art and architecture. *Preq:* Consent of instructor.

427, 627 Advanced Color Graphics 3(2,3) Theories of color classification and interaction; three-dimensional color modeling by computer; advanced application of color theories to art and architecture. *Preq:* CA AR 426 or consent of instructor.

428, 628 Computer-Aided Design 3(2,3) Introduction to the concepts, skills and applications of computer-aided design as they relate to the practice of architecture. *Preq:* Senior standing or approval of instructor.

430, 630 Theories and Philosophies of Technology and Architecture 3(3,0) A theoretical and practical examination of technology and architecture from pre-modern and modern viewpoints to study its nonneutral role in shaping and reflecting knowledge, beliefs, and actions within a cultural context.

451 Design Studies VII 5(0,10) Studio work with adjunct seminar/lecture concerned with advanced architectural design problems. *Preq:* CA AR 352. *Coreq:* CA AR 453.

452 Design Studies VIII 5(0,10) Continuation of CA AR 451. *Preq:* CA AR 451. *Coreq:* CA AR 454.

453 Design Theory VII 1(1,0) Study of advanced ideas and issues of architecture through the presentation of topics on theory, technology, and practice.

454 Design Theory VIII 1(1,0) Continuation of CA AR 453.

485, 685 Health Care Facilities Systems 3(3,0) Course introduces the concepts, organization, and direction of health and health-care services within the context of health-care delivery systems. Special emphasis is placed on mental and physical health-care facilities concepts. *Preq:* Consent of instructor.

488, 688 Health Care Facilities Programming Techniques 3(3,0) Seminar on recent research and innovations in health-care facilities programming and original investigation of assigned programming problems. *Preq:* Consent of instructor.

490, H490 Directed Studies 1-5 Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in architecture. *Preq:* Consent of department head.

557 Architecture Studio 6(0,18) City planning design and the development of complex building solutions.

801 Architecture Seminar 3(3,0)

802 Phenomenology of Architecture 3(3,0)

803 Theories of Architecture 3(3,0)

804 Modern Masters 3(3,0)

805 Architecture and the City 3(3,0)

821 Research Methods 3(3,0)

850 Architecture Studio 6(0,18)

853 Architecture Studio 6(0,18)

854 Architecture Studio 6(0,18)

857 Architecture Studio 6(0,18)

858 Thesis Research 3(0,9)

859 Thesis Manuscript 1-3(0,3-9)

881 Architectural Office Practice 3(3,0)

886 Health Care Components 3(3,0)

890 Directed Studies 1-5(1-5,0)

891 Thesis Project 3-9(0,9-27)

ARCHITECTURE CHARLESTON PROGRAM

(See courses listed under each field of study.)

Assistant Professor: R. T. Huff, *Director; Assistant Professor in Residence:* R. D. Crout

This program is located in Charleston, South Carolina and is available to qualified undergraduate students in Architecture, Art, Construction Science and Management, and Landscape Architecture. Studio work is oriented towards design within this historic seaport setting. Students also enroll in classes at the University of Charleston campus. The program is enriched by visiting scholars and professionals from the area.

ARCHITECTURE OVERSEAS PROGRAM (CA GE)

(See courses listed under each field of study.)

Professor: C. Fera, *Director; Assistant Professor in Residence:* R. T. Silance

The Daniel Center for Urban Studies in Genoa, Italy, is available to qualified Master of Architecture, Building Science and Management, Master of Fine Arts, and Master of City and Regional Planning students. Studio and classroom work in this historic port setting is enriched by visiting scholars and complemented by scheduled field trips, both in Italy and continental Europe.

ART AND ARCHITECTURAL HISTORY (A A H)

Professor: E. C. Voelker; *Associate Professors:* J. B. LeBlanc, G. L. Walker; *Visiting Associate Professor:* B. R. Collins; *Visiting Assistant Professor:* D. W. Houston

101, H101 Survey of Art and Architectural History I 3(3,0) Survey of architectural design and the decorative arts, landscape and building technology, in the Ancient Near East, Egypt, Greece, Rome, Byzantium, as well as Romanesque and Gothic Europe.

102, H102 Survey of Art and Architectural History I 3(3,0) Survey of Renaissance, Baroque and Neoclassical art and architecture. Introduction to the Modern Movement in Europe and America. *Preq:* A A H 101.

203, H203 History and Theory of Architecture I 3(3,0) First of a two-semester sequence of special topics and issues in the history of architecture. Emphasis on architectural theory and practice in the past and present. Analysis of differing approaches to history: chronological, typological, thematic, phenomenological. *Preq:* A A H 102.

204, H204 History and Theory of Architecture II 3(3,0) Second of a two-semester sequence on special topics and issues in the history of architecture. Emphasis on typologies of the house, governmental buildings, and sacred architecture. New directions in architectural historiography. *Preq:* A A H 203.

205, H205 History and Theory of Art I 3(3,0) First of a two-semester sequence on special topics and issues in the history of art. Emphasis on stylistic developments and specific art movements. Analysis of art within the larger context of social, political, religious history. Examination of art techniques and theory as they have developed. *Preq:* A A H 102.

206, H206 History and Theory of Art II 3(3,0) Second of a two-semester sequence on special topics and issues in the history of art. Continued emphasis on stylistic developments and art movements, with specific attention directed toward post-Renaissance art. Analysis of the influence of past history on modern. *Preq:* A A H 205.

210 Introduction to Art and Architecture 3(3,0) This one-semester lecture survey will introduce to the nonmajor student an overview of art and architecture from different time periods and cultures. Students will be encouraged to appreciate the contribution to art made by the great masters and to discern different styles, art techniques, and creative traditions.

301 Research Methodology 3(3,0) Introduction to the techniques of research through proposed subjects, library and computer research, critical written evaluations, and the preparation of written presentations.

305 Contemporary Art History 3(3,0) Study of contemporary art from World War II to

the present, exploring the forces that have shaped the various movements and directions. *Preq:* A A H 206.

H330 Honors Colloquium 3 Undergraduate honors colloquium with emphasis on interdisciplinary interpretations. An integration of art, architecture, landscape, and city planning. *Preq:* A A H 204 or 206 or consent of instructor.

391 Italian Studies Abroad I 3-6(3-6,0) SS On-site exposure of specific works of art and architectural monuments in Italy, coupled with lectures and study problems. May be taught alternately as a compact short course during the academic year with a short stay in Italy or during the summer with an extended foreign experience. May not be taken Pass/Fail. *Preq:* A A H 204 or 206 or consent of instructor.

392 British Studies Abroad I 3(3,0) On-site exposure to specific works of art and architectural monuments in Great Britain, coupled with lectures and study problems. May be taught alternately as a compact short course during the academic year with a short stay in Britain or during the summer with an extended foreign experience. May not be taken Pass/Fail. *Preq:* A A H 204 or 206 or consent of instructor.

393 French Visual Studies Abroad I 3(3,0) On-site exposure to specific works of art and architectural monuments in France, coupled with lectures and study problems. May be taught alternately as a compact short course during the academic year with a short stay in France, or during the summer with an extended foreign experience. May not be taken Pass/Fail. *Preq:* A A H 204 or 206 or consent of instructor.

394 Northern European Visual Studies Abroad I 3(3,0) On-site exposure to art and architecture in Northern European countries such as Belgium, Germany, and Holland coupled with lectures and study problems. May be taught alternately as a compact course during academic year with short stay in Northern Europe, or during summer with extended foreign experience. May not be taken Pass/Fail. *Preq:* A A H 204 or 206 or consent of instructor.

395 Special Topics in Visual Studies Abroad I 3(3,0) On-site exposure to art and architecture in foreign countries, coupled with lectures and study problems. Different countries may be selected for study at faculty discretion. May be taught as a compact course during academic year with short stay in foreign country, or during summer with extended foreign experience. May not be taken Pass/Fail. *Preq:* A A H 204 or 206 or consent of instructor.

396 Special Topics in Visual American Studies I 3(3,0) On-site exposure to specific works of art and architectural monuments throughout the U.S., coupled with lectures and study problems. May be taught alternately as a compact short course during the academic year with a short trip to areas of interest, or during the summer with extended travel. May not be taken Pass/Fail. *Preq:* A A H 204 or 206 or consent of instructor.

411, 611 Directed Research in Art and Architectural History 3(3,0) Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in art history.

412, 612 Directed Research in Art and Architectural History 3(3,0) Continuation of A A H 411.

413, 613 Twentieth Century Visual Arts 3(3,0) Consideration of the visual arts in the 20th century in relation to the factors that have influenced artists and the consequence of their production to society.

416 History of Landscape Architecture 3(3,0) Planetary survey of notable examples of mankind's constant efforts to arrange and bring order to his environment by design on the land. *Preq:* Junior standing or consent of instructor.

417, 617 Studies in the Art and Architecture of the Ancient World I 3(3,0) Consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece, and Rome) with a study in depth of selected examples from the period. *Preq:* A A H 204 or 206 or consent of instructor.

418, 618 Studies in the Art and Architecture of the Ancient World II 3(3,0) Consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece, and Rome), with a study in depth of selected examples from the

period. *Preq:* A A H 417.

419, 619 Studies in the Art and Architecture of the Early Middle Ages 3(3,0) Consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th centuries), with a study in depth of selected examples from the period. *Preq:* A A H 204 or 206 or consent of instructor.

420, 620 Studies in the Art and Architecture of the Late Middle Ages 3(3,0) Consideration of the visual arts and architectural monuments of the late Middle Ages (Western Europe from the 12th through the 15th centuries), with a study in depth of selected examples from the period. *Preq:* A A H 419.

423, 623 Studies in the Art and Architecture of the Renaissance I 3(3,0) Consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th centuries), with a study in depth of selected examples from the period. *Preq:* A A H 204 or 206 or consent of instructor.

424, 624 Studies in the Art and Architecture of the Renaissance II 3(3,0) Consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th centuries), with a study in depth of selected examples from the period. *Preq:* A A H 423.

425, 625 Architecture of the Technical Revolution 1685-1865 3(3,0) Consideration, in depth and particular, of the impact on architecture of the applied scientific method as it produced mechanical inventions, new construction material and methods, new power sources and production technique, and the social adjustments which all of these initiated. *Preq:* A A H 204 or 206 or consent of instructor.

427, 627 Eighteenth Century Visual Arts 3(3,0) Consideration of the visual arts: sculpture, painting, graphics, and furnishings of the 18th century in its environment, together with its precursors and later influence (1785-1815). *Preq:* A A H 204 or 206.

428, 628 Nineteenth Century Visual Arts 3(3,0) Consideration of the visual arts of the 19th century: painting, sculpture, printmaking, ceramics, and so forth, in relation to the factors that have influenced the artist and the consequence on society. *Preq:* A A H 427.

429, 629 Studies in the Art and Architecture of India and the Far East 3(3,0) Consideration of the visual arts and architectural monuments of India and the Far East, with a study in depth of selected examples from the period. *Preq:* A A H 204 or 206 or consent of instructor.

815 Art and Architectural History Seminar I 3(3,0)

816 Art and Architectural History Seminar II 3(3,0)

ASTRONOMY (ASTR)

Professors: D. D. Clayton, J. R. Ray; *Associate Professors:* T. F. Collins, P. J. Flower; *Assistant Professors:* D. H. Hartmann, M. D. Leising, B. S. Meyer

101 Solar System Astronomy 3(3,0) A descriptive survey of the universe, with emphasis on basic physical concepts and the objects in our solar system, is presented. Related topics of current interest will be included. For nonscience majors. This course may not be taken by a student who has completed ASTR 301.

102 Stellar Astronomy 3(3,0) A descriptive survey of the universe, with emphasis on basic physical concepts and galactic and extragalactic objects, is presented. Related topics of current interest will be included. For nonscience majors. This course may not be taken by a student who has completed ASTR 302.

103 Solar System Astronomy Laboratory 1(0,2) Optional laboratory to accompany ASTR 101. Demonstrations, laboratory exercises, planetarium visits, and a night laboratory using a small telescope, will supplement the lecture course. *Coreq:* ASTR 101.

104 Stellar Astronomy Laboratory 1(0,2) Optional laboratory to accompany ASTR 102. Demonstrations, laboratory exercises, planetarium visits, and a night laboratory, using a small telescope, will supplement the lecture course. *Coreq:* ASTR 102.

220 (GEOL) Planetary Science 3(3,0) See GEOL 220.

302 Stellar Astrophysics 3(3,0) Study of the basic physical concepts necessary for under-

standing the sun, other stars, and their evolution. Topics include star formation, stellar structure and evolution, binary stars, and observational techniques. *Preq:* PHYS 221 or consent of instructor.

303 Galactic Astrophysics 3(3,0) Study of the basic physical concepts necessary for understanding the structure of the galaxy, the motions of the stars within it, the nature of the interstellar matter, other galaxies, the large-scale structure of the universe, and the origin of the solar system. *Preq:* PHYS 221 or consent of instructor.

475, 675 Selected Topics in Astrophysics 1-3(0-3,0-9) Comprehensive study of an area of astrophysics. Areas to be studied may include nucleosynthesis and stellar evolution, extragalactic distance scale, structure and evolution of galaxies, and large-scale structure of the universe. May be repeated for a maximum of 6 credits, but only if a different topic is covered. *Preq:* ASTR 302 or consent of department head.

701 Solar System Astronomy for High School Teachers 3(3,0)

711 Stellar Astronomy for High School Teachers 3(3,0)

802 Stellar Structure and Evolution 3(3,0)

803 Galactic Structure 3(3,0)

805 Nuclear Astrophysics 3(3,0)

875 Selected Topics 1-3(1-3,0)

BIOCHEMISTRY (BIOCH)

Professors: C. S. Brown, R. H. Hilderman, G. L. Powell, J. M. Shively, J. K. Zimmerman; *Associate Professors:* A. G. Abbott, J. D. Weinstein; *Assistant Professors:* W. R. Marcotte, Jr., R. M. Tombes; *Adjunct Professor:* D. M. Henricks

210 Elementary Biochemistry 4(3,3) Discussion of the kinds of compounds found in living organisms, their biochemical reactions and significance. The laboratory work parallels classroom study. *Preq:* CH 102 or 112.

301 General Biochemistry 3(3,0) Introduction to the nature, production, and replication of biological structure at the molecular level and its relation to function. *Preq:* Organic Chemistry.

302 Molecular Biology Laboratory 1(0,3) Laboratory to accompany BIOCH 301. Introduction to fundamental laboratory techniques in biochemistry and molecular biology and a demonstration of some of the fundamental principles of molecular biology discussed in BIOCH 301. *Preq:* Organic Chemistry. *Coreq:* BIOCH 301.

406, 606 Physiological Chemistry 3(3,0) Chemical basis of the mammalian physiological processes of muscle contraction, nerve function, respiration, kidney function, and blood homeostasis is studied. Composition of specialized tissue such as muscle, nerve, blood and bone, and regulation of water, electrolytes and acid-base balance is discussed. *Preq:* BIOCH 210 or organic chemistry.

423, 623 Principles of Biochemistry 3(3,0) Study of the chemistry of amino acids, monosaccharides, fatty acids, purines, pyrimidines and associated compounds leads to an understanding of their properties and the relationship between structure and function that make them important in biological processes. The use of modern techniques is stressed. *Preq:* CH 224 or equivalent.

431, H431, 631 Physical Approach to Biochemistry 3(3,0) Study of chemical and physical properties of amino acids, lipids, nucleic acids, sugars and their biopolymers. Physical and mathematical analyses will be correlated with biological structure and function. *Preq:* One year of Organic Chemistry and BIOCH 301 or consent of instructor. *Coreq:* Physical Chemistry.

432, H432, 632 Biochemistry of Metabolism 3(3,0) Study of the central pathways of carbohydrate, lipid, protein, and nucleic acid metabolism. Bioenergetics, limiting reactions, and the regulation and integration of the metabolic pathways will be emphasized. *Preq:* BIOCH 431 or consent of instructor.

433, 633 General Biochemistry Laboratory I 2(0,4) Experiments selected to illustrate current methods used in biochemical research. *Preq:* Concurrent enrollment in BIOCH 423 or 431.

434, 634 General Biochemistry Laboratory II 2(0,4) Continuation of BIOCH 433. *Preq:* Concurrent enrollment in BIOCH 432.

491, H491 Special Problems in Biochemistry 1-8(0,3-24) Orientation in biochemical research; i.e., experimental planning, execution, and reporting. May be repeated for a maximum of 8 credits.

815 Lipids and Biomembranes 3(3,0)

817 Chemistry and Metabolism of Hormones 3(3,0)

820 Nucleic Acids and Protein Biosynthesis 3(3,0)

821 Proteins 3(3,0)

822 Enzymes 3(3,0)

831 Physical Biochemistry 3(3,0)

851 Biochemistry Seminar 1(1,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

BIOENGINEERING (BIO E)

Professors: J. Black, J. M. Colacino, R. L. Dooley, A. F. von Recum, *Head;* S. W. Shalaby; *Associate Professor:* D. L. Powers; *Assistant Professors:* V. M. Gharpuray, M. LaBerge, R. A. Latour, Jr.; *Adjunct Professors:* L. S. Bowman, G. Cooper IV, R. A. Draughn, H. I. Friedman, G. Heimke, R. M. Sade, F. A. Young, Jr.; *Adjunct Assistant Professor:* R. A. Straup

201 Organs and Their Replacements 3(3,0)F Designed to provide engineering, biological, and physical science students with an overview of the replacement of human body parts and the problems related to artificial devices.

302 Biomaterials 3(3,0)S Study of metallic, ceramic and polymer materials used for surgical and dental implants. Materials selection, implant design, physical and mechanical testing. Corrosion and wear in the body. In addition, physical and mechanical properties of tissue as related to microstructure are studied. *Preq*: CR E 310 or consent of instructor.

320 Introduction to Structural Biomechanics 3(3,0)S Introduction to the analysis of the mechanical function of the human body and the effect of external forces on the body. The study of the mechanics of the skeletal system is the main emphasis of the course. *Preq:* E M 201, 304, or consent of instructor.

401 Biomedical Design 3(3,0)F Covers basic steps in designing medical devices intended for short- or long-term implantation. Materials selection, fabrication processes, performance standards, cost analysis, and design optimization will be covered. A design project will be required. For engineering majors only. *Preq:* BIO E 302, 320, E M 304.

410 Advanced Artificial Organs 3(3,0)F Indepth analyses of bioengineering principles involved in the design and use of artificial organs: tribology of joints, fluid mechanics vs. heart components, gas diffusion and artificial skin, and mechanical aspects of dentistry. *Preq:* BIO E 302, 320, E M 304.

450 Special Topics in Biomedical Engineering 1-4(0-4,12-0) Comprehensive study of a topic of current interest in the field of biomedical engineering. May be repeated for a maximum of 6 credits, but only if different topics are covered. *Preq:* Consent of instructor.

800 Seminar in Bioengineering Research 1(1,0)

801 Biomaterials 3(3,0)

802 Compatibility of Biomaterials 3(1,6)

803 Polymeric Biomaterials 3(3,0)

804 Metallic and Ceramic Implant Materials 3(3,0)

805 Composite Biomaterials 3(3,0)

812 Orthopaedic Engineering and Pathology 3(3,0)

820 Structural Biomechanics 3(3,0)

821 Human Dynamics 3(3,1)

823 Artificial Cardiac Assistance and Replacement 2(2,0)

840 Creative Biomedical Engineering Design 3(2,2)

847 Elements of Bioengineering 4(4,0)

850 Special Topics in Biomedical Engineering 1-4(0-4,12-0)

870 Bioinstrumentation 3(2,2)

882 Biomaterials Implantology 4(2,6)

890 Internship 1-5(0,8-40)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

BIOLOGICAL SCIENCES (BIOSC)

210 Biology of Culture and Religion 3(3,0) Drawing on findings from sociobiology, evolution, genetics and molecular biology, this course examines the biology of man's culture and religion. Topics include coevolution of culture and gene systems; adaptive significance of religion; evolution, free-will and creative process; altruism; mysticism and states of consciousness. *Preq:* BIOL 103 and 104 or consent of instructor.

222 Human Anatomy and Physiology I 4(3,3) Basic introductory course in human anatomy and physiology covering the cell and tissues; skeletal, muscular, and nervous systems; sensory organs. Structured primarily for nursing and other allied health students. *Preq:* BIOL 103, CH 102, 106 or 112.

223 Human Anatomy and Physiology II 4(3,3) Continuation of BIOSC 222 covering digestive, respiratory, circulatory, urinary, endocrine and reproductive systems. *Preq:* BIOSC 222 or equivalent.

241 Ecology, the Environment, and Human Society 3(3,0) Basic principles of population biology, ecology, and environmental science as applied to the study of the interactions between human society and the biosphere. *Preq:* BIOL 104 or 111 or BOT 205.

302, H302 Invertebrate Biology 4(3,3) An indepth survey and comparison of free-living invertebrate animals emphasizing functional anatomy, development and evolutionary relationships. Participation in one weekend excursion to the Southeastern coast is optional. *Preq:* An introductory two-semester biology sequence with laboratory.

303, H303 Vertebrate Biology 4(3,3) Comprehensive survey of vertebrate animals including their taxonomy, morphology, evolution, and selected aspects of the natural history and behavior. *Preq:* An introductory two-semester biology sequence with laboratory.

304, H304 Biology of Plants 4(3,3) Survey of the major groups of plants, their biology, diversity, and evolution. *Preq:* BIOL 104 or 111 or BOT 205.

305, H305 Algae and Fungi 4(3,3) Introduction to the biology of the major groups of algae and fungi. The course emphasizes how select representatives of the algae and fungi are adapted to their environment through structural, physiological and life cycle modifications. *Preq:* BIOL 104 or 111 or BOT 205.

311 Tropical Biology 3(1,6) Fundamental approach to basic ecological and evolutionary principles in tropical ecosystems, concentrating primarily on the rainforest and coral reef. Laboratory includes a field trip to Belize over the spring break. *Preq:* BIOL 103 and 104, or 110 and 111 or equivalent; or consent of instructor.

313 (W F B) Conservation Biology 3(3,0) See W F B 313.

416, 616 (GEN) Molecular Genetics 3(3,0) See GEN 416.

418, 618 (GEN, MICRO) Biotechnology I: Nucleic Acids Techniques 4(2,4) Designed to provide basic training in the manipulation of genetic information using recombinant DNA technology. Included are techniques in molecular cloning, Southern and Northern analysis, clone library construction. *Preq:* BIOCH 210 or 301, MICRO 305 or consent of instructor.

420, H420, 620 Neurobiology 3(3,0) Designed to provide broad background in

neurobiology. Topics include neuroanatomical structure-function; conduction in the neuron; neurite growth and development; neuromuscular junction; chemistry, physiology, and pharmacology of specific neurotransmitters and receptors; visual process; axoplasmic transport; hypothalamic-pituitary regulation; theories of behavior; theories of learning and memory. *Preq:* BIOCH 210 or 301 or consent of instructor.

430, 630 (AG E) Engineering Modeling of Biological Systems 3(3,0) See AG E 430.

435, H435, 635 Principles of Evolution 4(4,0) Introduction to the fundamental principles and major concepts of the evolutionary process in animals, including a consideration of evolutionary theories, adaptive processes in populations, and major evolutionary patterns and to the principles of classification and systematics. *Preq:* GEN 302 or consent of instructor.

440, H440, 640 Developmental Animal Biology 4(3,3) Events and mechanisms responsible for the development of multicellular animals. Gametogenesis, fertilization, embryonic development, cellular differentiation, morphogenesis, larval forms and metamorphosis, asexual reproduction, regeneration, malignancy, and aging will be analyzed in terms of fundamental concepts and control processes. *Preq:* BIOCH 210 or 301 or consent of instructor.

441, H441, 641 Ecology 4(3,3) Fundamental approach to basic ecological principles underlying the interrelationship of organisms with their biotic and abiotic environments. *Preq:* BIOL 104, 111 or BOT 205 or consent of instructor.

442, H442, 642 Biogeography 3(3,0) Study of patterns of distribution of plants and animals in space and time. *Preq:* BIOSC 302 or 303 and 304 or 305 or consent of instructor.

443, 643 Aquatic Ecology 4(3,3) Study of basic ecological principles and concepts as they apply to aquatic environments: rivers and streams, lakes and ponds, reservoirs, swamps, marshes, estuaries, and marine systems. Laboratories will provide practical experience in techniques and methods used in the ecological analysis of physical, chemical, and biological properties of aquatic systems. *Preq:* Junior standing in a life science.

452, 652 Anatomy and Morphology of Vascular Plants 4(3,3) Studies of the anatomy, reproduction, and phylogenetic relationships of vascular plants. *Preq:* BIOL 104, 111, or BOT 205 or consent of instructor.

458, H458, 658 (AG E) Cell Physiology 3(3,0) Study of the chemical and physical principles of cell function emphasizing bioenergetics and membrane phenomena. *Preq:* BIOCH 210 or 301 or consent of instructor.

461, H461, 661 Cell Biology 4(3,3) Study of structure, function, and diversity of cells and cell biological technique, emphasizing biomembrane function, energy transduction, motility, cell cycle, secretion, and cellular digestion. Laboratory exercises will reinforce the principles presented in lecture and introduce several modern techniques used in cell biological research. *Preq:* BIOCH 301 or consent of instructor.

483, 683 Regulatory Biology I 4(3,3) Introduction to topics and techniques employed in the practice of regulatory biology, focusing on biological aspects of water, waste, and air problems. Actual litigations, plant sitings, and public documents will be used throughout the course. May be taken subsequent to BIOSC 484. *Preq:* One year of biology, one year of chemistry, one course in microbiology, or consent of instructor.

484, 684 Regulatory Biology II 4(3,3) The second course in a two-part series, introducing the student to the concerns of mutagenesis, teratogenesis, and carcinogenesis in an industrial setting with actual case problems studied. May be taken before BIOSC 483. *Preq:* One year of biology, one year of chemistry, a biochemistry course, or consent of instructor.

485, 685 Biological Assessment of Aquatic Environments 4(3,3) Course that teaches the theory and application of protocols using living organisms in monitoring biological effects of pollutants on aquatic systems. Fieldwork, laboratory, and contemporary case studies are emphasized. *Preq:* One year of introductory biology, one year of chemistry, an animal diversity course, or consent of instructor.

491, H491 Special Problems in Biological Sciences 2-4(0,6-12) Research problems in se-

lected areas of biological sciences to provide an introduction to research planning and techniques. May be taken for no more than a maximum of 8 credits. *Preq:* Junior or Senior standing or consent of instructor.

493 Senior Seminar 2(2,0) Analysis and discussion of papers from the primary literature of the biological sciences. Students will search the primary literature, present and analyze selected readings. *Preq:* Senior standing and either ENGL 314 or SPCH 250 or consent of instructor.

801 (AN PH) Electron Microscopy of Biological Specimens 3(1,6)

871 Selected Topics 1-4 (0-4, 0-6)

BIOLOGY (BIOL)

Professor: D. R. Helms; *Associate Professors:* J. L. Dickey, R. A. Garcia, R. J. Kosinski, C. K. Revis-Wagner, W. M. Surver, *Acting Head*; *Assistant Professors:* M. V. Ruppert, A. D. Smith, J. A. Waldvogel; *Lecturers:* J. R. Cummings, S. D. Flagg

103 General Biology I 4(3,3)[1] The first course in a two-semester sequence on the fundamentals of biology. Lecture and laboratory emphasize the structural, molecular, and energetic basis of cellular activities, fundamentals of genetic variability, reproductive strategies of organisms, and scientific processes. Diversity of animals and principles of evolution are introduced.

104 General Biology II 4(3,3)[1] Continuation of BIOL 103, emphasizing animals and plants as functional units, evolution and diversity of plants, and principles of evolution and ecology. *Preq:* BIOL 103.

109 Introduction to Life Science 4(3,3) Survey of topics in botany, zoology, microbiology and ecology emphasizing comprehension and practical application of life-science concepts to experiments and activities appropriate for the elementary school classroom. Enrollment preference given to Early Childhood and Elementary Education majors.

110 Principles of Biology I 5(4,3)[1] Introductory course designed for students majoring in biological disciplines of the College of Sciences. The course integrates lecture and laboratory and emphasizes a modern, quantitative, and experimental approach to explanations of structure, composition, dynamics, interactions, and evolution of cells and organisms. High school chemistry is recommended. *Coreq:* CH 101.

111 Principles of Biology II 5(4,3)[1] Continuation of BIOL 110 that emphasizes the study of plants and animals as functional organisms and the principles of ecology. *Preq:* BIOL 110.

710 Selected Topics 1-6(0-6,0-18)

711 Conceptual Themes in Biology 3(2,2)

BOTANY (BOT)

Professors: N. D. Camper, C. R. Dillon, L. A. Dyck, J. E. Fairey III; *Associate Professors:* R. E. Ballard, T. M. McInnis, Jr., T. P. Spira; *Visiting Professor:* J. B. Whitney, Jr.

205 Plant Form and Function 4(3,3) Introductory course designed for students majoring in plant sciences of the College of Agricultural Sciences and the College of Forest and Recreation Resources. The course integrates lecture and laboratory and emphasizes fundamental structures and functions of higher plants. *Preq:* BIOL 103 or consent of instructor.

301 Field Botany 3(2,3) Introductory study of the taxonomy, ecology, and evolutionary processes of plants native to South Carolina. Emphasis is on field work which requires visits to many different habitats for observation and study of plant diversity. *Preq:* BIOL 104 or 111 or BOT 205.

411, 611 Introductory Mycology 4(3,3) Introduction to the biology of all the groups of fungi and some related organisms, with considerations of the taxonomy, morphology, development, physiology, and ecology of representative forms. Laboratory includes col-

[1]Credit toward a degree will be given for only one combination of the following: BIOL 110 or 103 followed by BIOL 111 or 104 dependent on the requirements for the major.

lections, identification, and culture of native fungi. *Preq:* BIOL 104 or 111 or BOT 205.

413, 613 Phycology 4(3,3) Introduction to the biology of algae. Consideration is given to the structure, classification, evolution, natural history, physiology, and ecology of all algal groups. Laboratory includes experimentation, collection, and identification of both freshwater and marine algae, and field trip to the Florida Keys over the spring break. *Preq:* BIOL 104 or 111 or BOT 205.

421, H421, 621 Plant Physiology 4(3,3) The relations and processes which pertain to maintenance, growth, and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products, and liberation of energy. *Preq:* BIOL 104 or 111 or BOT 205 and CH 102 or 112.

431, H431, 631 Introductory Plant Taxonomy 4(3,3) Introduction to the basic principles and concepts of plant systematics with laboratory and field emphasis on the flora of South Carolina. *Preq:* BIOL 104 or 111 or BOT 205.

807 Seminar 1(1,0)

821 Inorganic Plant Metabolism 4(3,3)

822 Organic Plant Metabolism 3(3,0)

823 Plant Growth and Development 3(3,0)

824 Mode of Action of Growth Substances 4(3,3)

831 Advanced Plant Taxonomy 4(3,3)

835 Evolution of Plant Species 3(3,0)

842 Physiological Plant Ecology 3(3,0)

843 Physiological Plant Ecology Laboratory 1(0,3)

846 Plant Ecology 4(3,3)

850 Plant Tissue and Cell Culture 3(2,3)

851 Plant Anatomy 3(2,3)

861 Plant Cell Biology 3(3,0)

891 Master's Research. Credit to be arranged.

921 (HORT) Plant Physiology Colloquium 1(1,0)

991 Doctoral Research. Credit to be arranged.

BUSINESS ADMINISTRATION (M B A)

802 Managerial Economics 3(3,0)

803 Statistical Analysis of Business Operations 3(3,0)

804 Managerial Accounting and Information Systems 3(3,0)

805 Legal and Social Environment of Business 3(3,0)

806 Operations Management 3(3,0)

807 (FIN) Financial Management 3(3,0)

808 Managerial Problems in Marketing 3(3,0)

809 (MGT) Organization Theory and Behavior 3(3,0)

810 Managerial Policy 3(3,0)

811 International Business Management 3(3,0)

812 (FIN) Financial Markets and Institutions 3(3,0)

813 Industrial Relations 3(3,0)

814 Directed Research in Quantitative Analysis 3(3,0)

815 Directed Research in Qualitative Analysis 3(3,0)

816 Contracts, Corporate Coordination and Control 3(3,0)

817 Business Forecasting Techniques and Applications 3(3,0)

820 Business Communications and Ethics 3(3,0)

821 Business Taxation 3(3,0)

822 Corporate Financial Reporting 3(3,0)

823 International Accounting 3(3,0)

824 The Management of Sales Operations 3(3,0)

825 Advertising and Promotional Management 3(3,0)

826 Business Marketing 3(3,0)

828 Services Marketing 3(3,0)

831 (FIN) Computer Applications in Financial Management 3(3,0)

832 (FIN) International Financial Management 3(3,0)

834 (FIN) Advanced Financial Management 3(3,0)

835 (FIN) Investment Management 3(3,0)

836 (FIN) Real Estate Finance and Investment 3(3,0)

840 World Industrial Policy 3(3,0)

889 Organization Design and Theory 3(3,0)

890 Topics in Strategic Management 3(3,0)

895 Topics in Marketing 3(3,0)

CERAMIC ARTS (CR AR)

Associate Professor: H. G. Lefort

101 Pottery Materials 3(2,3) Occurrence and properties of pottery raw materials. Attention is devoted to the occurrence of natural pottery materials in South Carolina and the methods and equipment used in preparing these materials.

102 Pottery Drying and Firing 3(3,0) The drying and firing process used in pottery making. A discussion is included on the design and construction of simple pottery kilns, and the student is required to build and operate a small outdoor kiln. The laboratory work demonstrates the drying and firing behavior of pottery.

CERAMIC ENGINEERING (CR E)

Professors: R. J. Diefendorf, C. C. Fain, G. H. Haertling, G. Lewis, *Head; Associate Professors:* D. A. Brosnan, D. R. Dinger, B. I. Lee, H. G. Lefort, H. D. Leigh III, E. C. Skaar, T. D. Taylor

201 Introduction to Ceramic Engineering 2(2,0) Introduction to ceramic engineering together with a study of nonclay-silicate ceramic raw materials, property measurements, and terminology used in the manufacturing sequences of ceramic products. *Preq:* CH 101.

202 Processing Ceramic Raw Materials into Products 3(3,0) Study of the manufacturing of ceramic products from the point of view of clay-silicate raw materials characterization and preparation, mixing for quality, the characteristics of mixtures throughout the manufacturing sequences, and the study of forming procedures to obtain quality products. *Preq:* CH 101.

203 Introduction to Ceramic Engineering Calculations 2(1,1) Designed to meet the needs of ceramic engineers by providing a structured introduction to fundamental calculations in the field of ceramic and materials engineering. Each type of problem is related to ceramic processing or testing. The calculations are performed using a spreadsheet format and microcomputer. *Preq:* ENGR 180.

204 Laboratory Procedures 2(1,2) Introduction to ceramic laboratory procedures. Use of basic ceramic engineering machinery, testing equipment, and processes, e.g., dry pressing, slip casting, plaster-mold making, firing, glazing, and mechanical properties measurements. *Preq:* CH 101, MTHSC 106. *Coreq:* CH 102, MTHSC 108.

302 Thermo-Chemical Ceramics 3(3,0) High-temperature equilibrium using the laws of physical chemistry as applied to ceramic systems in both solid and liquid states. An introduction to the crystal chemistry of ceramic raw materials, and the effect of crys-

talline form on their high-temperature behavior.

303 Materials Technology in Product Selection by Consumers 2(2,0) Intended to convey to the consumer a sufficient understanding of the properties of materials—metals, plastics, and ceramics—to enable the customer to make intelligent buying decisions. Property characteristics are related to cost and performance. Specific cases involving decisions are used to illustrate fundamental principles. Simple tests to determine material properties are suggested for consumer use.

304 Experimental Design 3(1,4) A Junior-level laboratory course designed to expose the student to statistically-designed experimental techniques to solve ceramic engineering problems typically encountered in processing, testing, and manufacturing ceramic materials. *Preq:* CR E 202, 204.

307 Thermal Processing of Ceramics 3(3,0) The accomplishment of changes in structure and composition through the application of thermal energy. The course includes a study of simultaneous transfer of heat and mass, fluid flow, determinants of rates in a variety of reactions and calculations of the energy requirements to accomplish change in structure or composition.

309 Research Methods 2(0,6) The planning and solution of selected research problems. *Preq:* CR E 304.

310 Introduction to Material Science 3(3,0) A beginning course in material science designed primarily for engineering students. Study of the relation between the electrical, mechanical, and thermal properties of products and the structure and composition of these products. All levels of structure are considered from gross structures easily visible to the eye through electronic structure of atoms. *Preq:* CH 101, MTHSC 106.

311 Kinetics of Materials Processes 3(3,0) Study of the kinetics of solid-solid, solid-liquid and solid-gaseous reaction as they apply to materials system, energy transport as applied to materials processing and the importance of these phenomena to manufacturing and design of materials. *Preq:* CH 331.

400 Ceramic Seminar 1(1,0) Seminars used to expose Engineering majors to topics in the ceramic engineering profession. Invited lecturers as well as faculty and students will participate. Course may be repeated for a total of 4 credits. To be taken Pass/Fail only. *Preq:* Junior standing in Ceramic Engineering or consent of instructor.

402, H402, 602 Solid State Ceramics 3(3,0) The effects of the composition, form and shape of ceramic raw materials on the manufacturing processes and final properties of ceramic products. Included are fundamental studies of such phenomena as deflocculation, plasticity, sintering, and the behavior of ceramic products in electrical circuits. *Preq:* Junior standing.

403, H403, 603 Glasses 3(3,0) Glass structure and composition and their relation to the properties of glasses. Consideration is given to the processing variables which control the properties of glasses including glass products, enamels, glazes, and vitreous bonds.

404, 604 Ceramic Coatings 3(3,0) The raw materials, methods of manufacture, and properties of ceramic coating. *Preq:* CR E 302.

406 Ceramic Project 2(0,6) The completion of an original research into a ceramic problem. May be repeated for a maximum of 4 credits. *Preq:* CR E 302.

407 Plant Design 3(1,6) The application of the fundamentals of ceramic engineering to problems in plant design. *Preq:* Senior standing in Ceramic Engineering.

410, 610 Analytical Processes 3(2,3) Introductory course on the theory and use of X-ray diffraction and spectroscopic methods. *Preq:* Junior standing.

412, 612 Raw Material Preparation 3(3,0) Equipment and processes used in the crushing and grinding of raw materials, separation and classification of particle sizes, and separation and purification of minerals by dressing methods.

414, 614 Processing of Ceramics 3(3,0) Course covers ceramic processing after the raw material preparation with emphasis on modern processing theories and practices. Topics include nature of particles, forming methods, characterization techniques, consolidation by heat, surface chemistry of solids, and chemical processing of specialized ceramics and composites. *Preq:* CH 102 or equivalent.

416, 616 Electronic Ceramics 3(3,0) Theory and measurement of the electronic properties of ceramic products.

417, 617 Industrial Fuels and Combustion 3(3,0) Study of the application of burners, fuels, and control equipment to industrial kilns and furnaces. Emphasis will be given to current industrial equipment and practices. Topics include fuel chemistry, combustion analysis, ratio-control systems, flow and pressure measurement and control, burners, flames and heat transfer. *Preq:* CH 102 and CR E 307 or consent of instructor.

418, 618 Process Control 3(3,0) Process control techniques and apparatus with particular emphasis on temperature measurement and control systems. The application of laboratory techniques to the control of product quality and process efficiency is included. *Preq:* Junior standing.

419, H419, 619 Science of Engineering Materials 3(3,0) Course planned to acquaint engineers with the thermal, electrical, and chemical characteristics of engineering materials. It emphasizes fundamental consideration of the structure of matter in the solid and glassy states, solid state reactions, and the influence of particle and aggregate structure to speed of reaction and product properties. The reasons for the properties of materials at elevated temperatures and room temperatures are related to these fundamentals.

420, 620 Science of Engineering Materials 3(3,0) Continuation of CR E 419 with emphasis on application of fundamentals in nuclear reactors and nuclear power plants. Consideration is given to the development of ceramics for fuel elements, moderator materials, control rods, shielding and radioactive waste disposal.

425, 625 Specialized Processing of Ceramic Materials 3(2,2) Processing of ceramic materials under conditions such as ultra high vacuum or gravity-free conditions. Emphasis will be placed on adapting one selected ceramic process to a set of special conditions selected by the instructor. *Preq:* Junior standing in engineering or consent of instructor.

430, 630 Fine Particle Processing in Ceramic Systems 3(3,0) A study of the cause-and-effect relationship in particulate suspensions controlling rheological behavior, porosity, packing densities, shrinkage, and other properties of ceramic ware. Subjects covered will include particle size analysis techniques and measurements, particle packing, rheological properties and measurements, surface area analysis, and interfacial chemicals including both flocculants and deflocculants. *Preq:* CR E 202, 204, 304 or consent of instructor.

490, H490, 690 Special Topics in Ceramic Engineering 1-3(1-3,0) Study of topics not ordinarily covered by other courses. Taught as the need arises. Typical topics could include current research in a specific area or technological advances. May be repeated for a maximum of 6 credits, but only if different topics are covered. *Preq:* Consent of instructor.

701 Special Problems 3(1-3,0)

800 Ceramic Engineering Seminar 1(1,0)

807 Specialized Ceramics 3(3,0)

809 High Temperature Materials 3(3,0)

814 Ceramic Physical Processing 3(3,0)

815 Colloidal and Surface Science 3(3,0)

816 Constitution and Structure of Glasses 3(3,0)

821 Analytical Procedures and Equipment I 3(2,3)

822 Analytical Procedures and Equipment II 3(2,3)

824 Mechanical Properties of Ceramic Materials 3(3,0)

825 Magnetic and Electrical Ceramic Materials 3(3,0)

826 Ceramic Coatings 3(3,0)

828 Solid State Ceramic Science 3(3,0)

832 Ceramic Reaction Thermodynamics 3(3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

CHEMICAL ENGINEERING (CH E)

Professors: W. B. Barlage, Jr., C. H. Barron, Jr., *Head;* J. N. Beard, Jr., W. F. Beckwith, D. D. Edie, C. H. Gooding, J. M. Haile, S. S. Melsheimer, J. C. Mullins; *Associate Professors:* A. A. Ogale, R. W. Rice, M. C. Thies; *Assistant Professor:* D. E. Hirt; *Lecturer:* G. B. Pullen

201 Introduction to Chemical Engineering 3(2,2) Introduction to fundamental concepts of chemical engineering, including mass and energy balances, PVT relations for gases and vapors, and elementary phase equilibria. *Preq:* CH 112 (preferred) or CH 102, ENGR 180 and PHYS 122.

220 Chemical Engineering Thermodynamics I 3(3,0) Topics include first and second laws of thermodynamics, ideal gases, PVT properties of real fluids, energy balances with chemical reactions, and thermodynamic properties of real fluids. *Preq:* CH E 201 and MTHSC 206.

252 Process Modeling and Numerical Methods 2(2,0) Course will introduce students to some concepts of chemical process modeling and the use of numerical methods for solution of typical chemical engineering problems. Digital computational techniques for the numerical methods will use a specific procedure-oriented language such as FORTRAN. *Preq:* CH E 201. *Coreq:* MTHSC 208.

301 Unit Operations I 3(3,0) General principles of chemical engineering and study of the following unit operations: fluid flow, fluid transportation, and heat transmission. Special emphasis is placed on theory and its practical application to design. *Preq:* CH E 201, MTHSC 206. *Coreq:* CH E 252.

302 Unit Operations II 3(3,0) Study of evaporation and selected unit operations based on diffusional phenomena. Primary attention will be given to differential contact operations such as absorption, humidification and gas-liquid contact. *Preq:* CH E 220, 252, 301.

306 Unit Operations Laboratory I 2(1,3) Laboratory work in the unit operations of fluid flow, heat transfer, and evaporation. Stress is laid on the relation between theory and experimental results and the statistical interpretation of those results and on report writing. *Preq:* CH E 301, E G 209. *Coreq:* EX ST 411 or MTHSC 302.

319 Engineering Materials 2(2,0) Introduction to the fundamental properties and behavior of engineering materials. Emphasis will be placed on polymers, metals, ceramics, and composite materials. *Preq:* CH 223, CH E 220, EM 201.

321, H321 Chemical Engineering Thermodynamics II 3(3,0) Continuation of CH E 220. Topics include thermodynamics of power cycles and refrigeration/liquefaction, thermodynamic properties of homogeneous mixtures, phase equilibria, and chemical reaction equilibria. *Preq:* CH 331, CH E 220, 252, MTHSC 208.

353, H353 Process Dynamics and Control 3(3,0) Mathematical analysis of the dynamic response of process systems. Basic automatic control theory, and design of control systems for process applications. *Preq:* CH E 252, 301, and MTHSC 208.

401, H401, 601 Transport Phenomena 3(3,0)S Mathematical analysis of single and multi-dimensional steady-state and transient problems in momentum, energy, and mass transfer. Both the similarities and differences in these mechanisms are stressed. *Preq:* CH E 302 and MTHSC 208.

403, H403 Unit Operations III 3(3,0)F Study of liquid-liquid extraction, distillation, and other unit operations. *Preq:* CH E 302, 321 and CH 332.

407 Unit Operations Laboratory II 3(1,6)F Continuation of CH E 306 with experiments primarily on the diffusional operations. Additional lecture material on report writing and general techniques for experimental measurements and analysis of data, including statistical design of experiments. *Preq:* CH E 302, 306, 353.

412, 612 Polymer Engineering 3(3,0) Design-oriented course in synthetic polymers. Top-

ics include reactor design used in polymer production, effect of step versus addition kinetics on reactor design, epoxy curing reactions, polymer solubility, influence of polymerization and processing conditions on polymer crystallinity. *Preq:* CH 224 and 332 or consent of instructor.

415, 615 Introduction to Nuclear Engineering 3(3,0) Designed to acquaint the nonnuclear engineer with some of the engineering aspects of nuclear science. Topics include a brief survey of particle physics; nuclear reactions; energy transformations; nuclear reactors, their design, construction and use; radiation damage to materials of construction; and special problems in nuclear engineering peculiar to the basic engineering disciplines. *Preq:* Junior or Senior standing in engineering, chemistry, or physics.

421 Process Development, Design, and Optimization of Chemical Engineering Systems I 3(2,3)F Through the spring 1995. Study of the steps in creating a chemical process design from the original concept to successful completion and operation of the plant. Topics include engineering economics, systems analysis, simulation, optimization, process equipment sizing and selection. *Preq:* CH E 302.

422 Process Development, Design, and Optimization of Chemical Engineering Systems II 3(0,9)S Through the spring 1995. Continuation of CH E 421. The principles of process development, design, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. *Preq:* CH E 321, 353, 403, 407, 421 and 450; or consent of department head.

424, 624 Introduction to Industrial Pollution 3(3,0) Introduction to air and water pollution problems associated with chemical processing, transportation and power generation. Basic processes and mechanisms utilized in the control of liquid and gaseous wastes are discussed from a standpoint of equipment design and economics. Present and future trends in pollution legislation are reviewed. *Preq:* Senior standing or consent of instructor.

426 Pulp and Paper Engineering 3(3,0) Study of the unit processes and design of the processing equipment used in the pulp and paper industry. *Preq:* CH 102 or 112.

428, 628 (AG E) Biochemical Engineering 3(3,0) Use of microorganisms and enzymes for the production of chemical feedstocks, single-cell protein, antibiotics, and other fermentation products. Topics include kinetics and energetics of microbial metabolism, design and analysis of reactors for microbial growth and enzyme-catalyzed reactions, and considerations of scale-up, mass transfer, and sterilization during reactor design. *Preq:* Agricultural Engineering majors take AG E (BIOSC) 430 and MICRO 305, BIOCH 301; Chemical Engineering majors take CH E 302 as prerequisite and CH E 450 as coreq.

431 Process Development, Design, and Optimization of Chemical Engineering Systems I 3(2,3) Study of the steps in creating a chemical process design from the original concept to successful completion and operation of the plant. Topics include engineering economics, systems and analysis, simulation, optimization, process-equipment sizing, selection, and costing. *Preq:* CH E 252, 302, 306. *Coreq:* CH E 403.

432 Process Development, Design, and Optimization of Chemical Engineering Systems II 5(0,15) Continuation of CH E 431. The principles of process development, design, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. *Preq:* CH E 321, 353, 403, 407, 431, and 450 or consent of department head.

440 Chemical Engineering Senior Seminar I 0(1,0) Through the fall of 1994. Topics covered include oral communication, job interviewing skills, professionalism and professional ethics, and chemical engineering job functions in various industries. Oral presentations are given by students, and invited speakers from the profession will discuss issues of current interests. To be taken Pass/Fail only. *Preq:* CH E 302. *Coreq:* CH E 421.

441 Chemical Engineering Senior Seminar II 0(1,0) Through the spring of 1995. Continuation of CH E 440. To be taken Pass/Fail only. *Preq:* CH E 440. *Coreq:* CH E 422.

443 Chemical Engineering Senior Seminar I 1(1,0) Topics covered include oral communications, job interviewing skills, professionalism and professional ethics, and chemical engineering job functions in various industries. Oral presentations are given by

students, and invited speakers from the profession discuss issues of current interest. *Preq:* CH E 302, SPCH 250. *Coreq:* CH E 431.

444 Chemical Engineering Senior Seminar II 1(1,0) Continuation of CH E 443. *Preq:* CH E 443. *Coreq:* CH E 432.

450, H450, 650 Chemical Reaction Engineering 3(3,0)F Review of kinetics of chemical reations, and an introduction to the analysis and design of chemical reactors. Topics include homogeneous and heterogeneous rections, batch and continuous flow reaction systems, catalysis, and design of industrial reactors. *Preq:* CH E 302, 321, and CH 332.

454, 654 Computer Process Control 3(3,0) Introduction to digital computer control as applied in the chemical process industries. Topics include dynamics of process systems, control computer hardware and software, sampled data mathematics, digital control algorithms, process identification, and advanced control techniques. *Preq:* CH E 353 or equivalent and E C E 307, MTHSC 208.

491, H491 Special Projects in Chemical Engineering 1-3(1-3,0) As a need arises, special topics requested by students or offered by the faculty will be taught. Review of current research in an area, technological advances, and national engineering goals are possible topic areas. May be repeated for a maximum of 6 credits, but only if different topics are covered.

802 Process Dynamics and Control 3(3,0)

803 Advanced Transport Phenomena 3(3,0)

804 Chemical Engineering Thermodynamics 3(3,0)

805 Chemical Engineering Kinetics 3(3,0)

813 Chemical Engineering Finite Element Analysis 3(3,0)

814 Applied Numerical Methods in Process Simulation 3(3,0)

815 Polymer Engineering Laboratory 3(2,3)

818 Polymer Processing 3(3,0)

819 Viscoelastic Properties of Polymers and Polymeric Composites 3(3,0)

820 (T C) Composite Polymeric Materials 3(3,0)

821 Heat Transport 3(3,0)

822 Mass Transfer and Differential Contact Operation 3(3,0)

823 Mass Transfer and Stagewise Contact Operation 3(3,0)

829 Membrane Separation Processes 3(3,0)

834 Advanced Chemical Engineering Thermodynamics 3(3,0)

845 Selected Topics in Chemical Engineering 3(3,0)

846 Selected Topics in Chemical Engineering 3(3,0)

890 Special Projects 1-6(1-6,0)

891 Master's Research. Credit to be arranged.

895 Chemical Engineering Graduate Seminar 1(1,0)

945 Selected Topics in Chemical Engineering 3(3,0)

946 Selected Topics in Chemical Engineering 3(3,0)

991 Doctoral Research. Credit to be arranged.

CHEMISTRY (CH)

Professors: R. A. Abramovitch, A. L. Beyerlein, D. D. DesMarteau, I. D. Eubanks, J. F. Geldard, J. W. Huffman, J. D. Petersen, *Head;* H. G. Spencer, T. G. Tisue; *Associate Professors:* R. C. Dieter, A. L. Kholodenko, J. W. Kolis, R. K. Marcus, G. H. Robinson, R. R. Williams; *Assistant Professors:* J. R. Appling, J. D. Beckerle, M. M. Cooper, G. B. Jones, E. J. Parsons, Y. Sun; *Lecturers:* D. W. Bearden, L. T. Eubanks, W. T. Pennington; *Visiting Professor:* J. D. Spain; *Visiting Assistant Professors:* C. W. Bauknight, Jr., D. E. Mlsna, J. J. Ott, S. J. Schauer

101, H101 General Chemistry 4(3,3) Students are introduced to the elementary concepts of chemistry through classroom and laboratory experience. The course emphasizes chemical reactions and the use of symbolic representation, the mole concept and its applications and molecular structure.

102, H102 General Chemistry 4(3,3)[1] Continuation of CH 101, treating solutions, rates of reactions, chemical equilibrium, electrochemistry, chemistry of selected elements, and an introduction to organic chemistry. For students taking one year of chemistry or continuing in CH 201. *Preq:* CH 101.

105 Beginning General and Organic Chemistry 4(3,3) Elementary treatment of principles of general and organic chemistry for students in liberal arts, education, business, health science, and selected life-science curricula. The laboratory is coordinated with the lecture. (Credits toward a degree given for only one of CH 101 and 105.) *Preq:* May not be taken as a prerequisite for organic chemistry.

106 Beginning General and Organic Chemistry 4(3,3) Continuation of CH 105. Topics in elementary organic chemistry with an emphasis on organic chemistry relevant to life processes are developed in both lecture and laboratory. (Credit towards a degree will be given for only one of the following: CH 106, 102, or 112.) May not be taken as a prerequisite for organic chemistry. *Preq:* C or better in CH 105, or consent of instructor.

112, H112 General Chemistry 4(3,3)[1] Continuation of CH 101 which emphasizes solutions, thermodynamic concepts, kinetics and oxidation-reduction reactions. The laboratory emphasizes solution chemistry and qualitative analyses. Recommended for students continuing in CH 223. *Preq:* CH 101.

141 Chemistry Orientation 1(1,0) Lectures, discussions, and demonstrations devoted to health and safety in the chemistry laboratories; use of the chemical literature; and career planning. *Preq:* Registration in CH 101.

201 Survey of Organic Chemistry 4(3,3)[2] Introduction to organic chemistry emphasizing nomenclature, classes of organic compounds, chemistry of functional groups. For students needing a one-semester course in organic chemistry. *Preq:* CH 102 or consent of instructor.

205 Introduction to Inorganic Chemistry 2(2,0) One semester treatment which emphasizes the properties and reactions of the more common chemical elements. *Preq:* Registration in CH 112.

223 Organic Chemistry 3(3,0)[2] Introductory course covering the principles of organic chemistry and the derivation of these principles from a study of the properties, preparations, and interrelationships of the important classes of organic compounds. *Preq:* CH 112 or consent of instructor.

224 Organic Chemistry 3(3,0) Continuation of CH 223. *Preq:* CH 223.

225 Organic Chemistry Laboratory 2(0,6)[3] The laboratory techniques involved in the synthesis, separation and purification, and characterization of typical examples of the classes of organic compounds. *Preq:* Registration in CH 223.

226 Organic Chemistry Laboratory 2(0,6)[4] Continuation of CH 225. *Preq:* Registration in CH 224.

227 Organic Chemistry Laboratory 1(0,3)[3] The synthesis and properties of typical examples of the classes of organic compounds. *Preq:* Registration in CH 223.

228 Organic Chemistry Laboratory 1(0,3)[4] Continuation of CH 227. *Preq:* CH 227 and registration in CH 224.

229 Organic Chemistry Laboratory 1(0,3)[3] A one-semester laboratory for chemical engineering students. *Preq:* CH 223.

[1]Credit toward a degree will be given for only one of the following: CH 102 or 112.

[2]Credit toward a degree will be given for only one of the following: CH 201 or 223.

[3]Credit toward a degree will be given for only one of the following: CH 225, 227 or 229.

[4]Credit toward a degree will be given for only one of the following: CH 226 or 228.

[5]Credit toward a degree will be given for only one of the following: CH 315 or 317.

[6]Credit toward a degree will be given for only one of the following: CH 330 or 331.

313 Quantitative Analysis 3(3,0) The fundamental principles of volumetric, gravimetric and certain elementary instrumental chemical analyses. *Preq:* Concurrent enrollment for credit in CH 315 or 317.

315 Quantitative Analysis Laboratory 2(0,6)[5] The laboratory techniques of volumetric, gravimetric, and elementary instrumental chemical analyses. *Coreq:* Concurrent enrollent for credit in CH 313.

317 Quantitative Analysis Laboratory 1(0,3)[5] The standard techniques of analytical chemistry–gravimetric, volumetric, and instrumental. *Coreq:* Concurrent enrollment for credit in CH 313.

330 Introduction to Physical Chemistry 3(3,0)[6] A one-semester treatment of physical chemistry which emphasizes topics that are especially useful in the life sciences, agriculture and medicine: Chemical thermodynamics, equilibrium, solutions, kinetics, electrochemistry, macromolecules, and surface phenomena. *Preq:* One semester of calculus.

331, 631 Physical Chemistry 3(3,0)[5] Includes the gaseous state, thermodynamics, chemical equilibria, and atomic and molecular structure, from both experimental and theoretical points of view. *Preq:* MTHSC 206, physics.

332, H332, 632 Physical Chemistry 3(3,0) Continuation of CH 331, including chemical kinetics, liquid and solid state, phase equilibria, solutions, electrochemistry and surfaces.

339, 639 Physical Chemistry Laboratory 1(0,3) Experiments are selected to be of maximum value to Chemistry and Chemical Engineering majors. *Preq:* Registration in CH 331.

340, 640 Physical Chemistry Laboratory 1(0,3) Continuation of CH 339. *Preq:* Registration in CH 332.

402, H402, 602 Inorganic Chemistry 3(3,0) Basic principles of inorganic chemistry are discussed with special emphasis on atomic structure, chemical bonding, solid state, coordination chemistry, organometallic chemistry and acid-base theories. The chemistry of certain selected elements is treated. *Preq:* CH 331, 332.

411, 611 Instrumental Analysis 4(2,6) Demonstration and operation of modern optical and electronic precision-measuring devices as they apply to the processes of analytical, physical, and organic chemistry. *Preq:* Physical chemistry.

413, H413 Chemistry of Aqueous Systems 3(3,0) Chemical equilibria in aqueous systems, especially natural waters; acids and bases, dissolved CO_2, precipitation and dissolution, oxidation-reduction, adsorption, etc. *Preq:* CH 101, 102 or 112, or 105, 106.

421, H421, 621 Advanced Organic Chemistry 3(3,0) Survey of modern organic chemistry with an emphasis on synthesis and mechanisms. *Preq:* CH 224, 332, or equivalent.

427, H427, 627 Organic Spectroscopy 3(2,3) Survey of modern spectroscopic techniques used in the determination of molecular structure. Emphasis is on the interpretation of spectra: nuclear magnetic resonance, ultraviolet, infrared, mass spectroscopy, optical rotatory dispersion and circular dichroism. *Preq:* One year each of organic chemistry and physical chemistry.

435, 635 Atomic and Molecular Structure 3(3,0) Provides an introduction to quantum theory and its application to atomic and molecular systems. Topics include harmonic oscillator, hydrogen atom, atomic and molecular orbital methods, vector model of the atom, atomic spectroscopy, and molecular spectroscopy. *Preq:* CH 332 or consent of instructor.

441 Glass Manipulation 2(0,6) A course designed to teach the fundamentals of glass manipulation and its application to the construction and repair of simple laboratory apparatus.

443 Research Problems 3(0,9) Original investigation of an assigned problem in a fundamental branch of chemistry. This work must be carried out under the supervision of a member of the staff. *Preq:* Senior standing in Chemistry or consent of instructor.

444 Research Problems 3(0,9) Continuation of CH 443.

454, H454, 654 Chemical Synthesis 3(1,6) Designed to introduce the student to modern

research techniques in inorganic and organic chemistry. Experiments to be carried out involve the synthesis of various types of compounds by diverse experimental techniques. Modern instrumental methods will be used to characterize the products. *Preq:* Organic chemistry.

491, H491, 691 Introduction to Radiochemistry 3(2,3) Study of natural and synthetic isotopes, including atomic and nuclear structures, properties of radiation, tracer techniques and applications of tracer techniques. *Preq:* Senior or graduate standing, consent of instructor.

700 Physical Science in Elementary School—Chemistry 3(2,3)

701 Review of General Chemistry 3(3,0)

702 Chemistry for High School Teachers 3(2,3)

703 Selected Topics in Chemistry for Teachers 3-6(2-6,6-0)

804 Fundamental Principles of Inorganic Chemistry 3(3,0)

805 Theoretical Inorganic Chemistry 3(3,0)

806 Physical Methods in Inorganic Chemistry 3(3,0)

807 Chemistry of the Transition Elements 3(3,0)

808 Chemistry of the Nonmetallic Elements 3(3,0)

809 Chemical Applications of X-Ray Crystallography 3(2,2)

811 Analytical Chemistry 3(3,0)

812 Chemical Spectroscopic Methods 3(2,3)

814 Electroanalytical Chemistry 3(2,3)

816 Separation Science 3(3,0)

818 Surface and Thin-Film Analysis 3(3,0)

820 Fundamentals of Organic Synthesis 3(3,0)

821 Organic Chemistry I 3(3,0)

822 Organic Chemistry II 3(3,0)

824 Fundamental Principles of Polymer Chemistry 3(3,0)

825 Chemistry of Heterocyclic Compounds 3(3,0)

830 Fundamentals of Physical Chemistry 3(3,0)

831 Chemical Thermodynamics 3(3,0)

834 Statistical Thermodynamics 3(3,0)

835 Chemical Kinetics 3(3,0)

837 Quantum Chemistry 3(3,0)

840 Techniques of Experimental Chemistry 3(1,6)

851 Seminar 0-2

861 Principles of Biochemistry 3(3,0)

891 Master's Research. Credit to be arranged.

900 Advanced Topics in Inorganic Chemistry 1-4(1-4,0)

910 Special Topics in Analytical Chemistry 1-4(1-4,0)

920 Advanced Topics in Organic Chemistry 1-4(1-4,0)

930 Advanced Topics in Physical Chemistry 1-4(1-4,0)

991 Doctoral Research. Credit to be arranged.

CIVIL ENGINEERING (C E)

Professors: S. C. Anand, L. C. Bell, R. H. Brown, *Head;* J. L. Burati, J. E. Clark, C. H. Juang, R. F. Nowack, B. L. Sill, P. R. Sparks; *Associate Professors:* N. M. Aziz, W. Baron, E. J. Hayter, J. K. Nelson, D. B. Stafford; *Assistant Professors:* S. Amirkhanian, T. A. Reinhold, S. R. Sanders, S. D. Schiff, J. M. Snyder; *Adjunct*

Associate Professors: T. J. Anessi, D. J. Fallon; *Adjunct Assistant Professors:* W. H. Dallis, Jr., S. C. McCutcheon, J. A. Murden

201 Surveying 3(2,3) Elementary plane surveying for civil engineering and other students whose curriculum requires a basic knowledge of surveying. Coverage includes measurement of distance, angles and elevations, stadia, topography, area and volume calculations, construction surveying. Field exercises provide practice in the use of surveying instruments. *Preq:* MTHSC 106.

301, H301 Structural Analysis 3(3,0) Analysis of statically determinate structural elements and systems. Influence lines for beams and trusses. Calculation of rotations and deflections by moment area, conjugate beam and unit load methods. Moment distribution and introduction to other methods of indeterminate analysis. Use of microcomputers for the analysis of trusses, continuous beams, and frames. *Preq:* E M 304; *Coreq:* C E 305.

302, H302 Structural Steel Design 3(3,0) Design of steel tension members, beams, beam-columns, and bolted, riveted and welded connections using load and resistance factor design methodology. Emphasis is on LRFD-AISC specifications for steel design. *Preq:* C E 301.

305 Computational Methods in Civil Engineering 3(3,0) Solution to civil engineering problems by computational methods. Techniques for curve fitting and data analysis are also studied. The use of computer programming and spreadsheets are emphasized. *Preq:* ENGR 180. *Coreq:* MTHSC 208.

310 Transportation Engineering 4(3,2) Planning, location, design, operations, and administration of highways, railroads, airports and other transportation facilities, including economic considerations, pavement design, and computer applications. *Preq:* C E 201 and EX ST 301.

320 Introduction to Construction Materials 3(2,3) Basic properties of portland cement and bituminous asphalt. Classification of aggregates on the basis of strength and size distribution. Mix design procedures, field control, and adjustments. Properties of fresh mixes and hardened concrete. Behavior of other construction materials including metals, composites, and plastics. Field trips to nearby plants. *Preq:* E M 305. *Coreq:* EX ST 301.

324 Introduction to Construction Engineering 3(3,0) Construction contracts, technical specifications, cost estimating and competitive bid process, construction methods and equipment, cost control, project scheduling, materials management, labor relations, project safety, and innovative technologies. *Preq:* C E 320.

330 Soil Mechanics 4(3,3) Mechanical and physical properties of soils and their relation to soil action in problems of engineering, such as classification, permeability, shearing strength, consolidation, stress distribution and failure analysis of soils. *Preq:* E M 304 and Junior standing.

402, H402, 602 Reinforced Concrete Design 3(3,0) Design of reinforced concrete beams, slabs, columns, and footings using ultimate strength design. An introduction to working stress design methods is included. *Preq:* C E 301.

403, 603 Use of Computers in Structural Analysis and Design 3(3,0) Analysis and design of statically determinate and indeterminate structural systems through the use of computers. Emphasis is placed on use of available computer programs likely to be used in industry. *Preq:* C E 301.

404, 604 Masonry Structural Design 3(3,0) Fundamentals of masonry materials, construction and structural systems. Application of structural design principles to multistory structures. Lateral load-resisting shear walls, loadbearing walls, columns and pilasters, and connections. *Preq:* C E 402.

405, 605 Structural Systems Design 3(3,0) Study of physical properties and mechanical response of engineered structural systems. Analytical and approximate methods of structural analysis are used to generate comparative structural performance data. *Preq:* C E 302. *Coreq:* C E 402 or consent of instructor.

410, 610 Traffic Engineering: Operations 3(3,0) Basic characteristics of motor-vehicle traffic; highway capacity; applications of traffic control devices; traffic design of park-

ing facilities; engineering studies, traffic safety; traffic laws and ordinances; public relations. *Preq:* C E 310.

412, 612 Urban Transportation Planning 3(3,0)F Urban travel characteristics; characteristics of transportation systems; transportation and land-use studies; trip distribution and trip assignment models; city patterns and subdivision layout. *Preq:* C E 310.

417, 617 Airphoto Interpretation I 3(2,3) A brief review of the basic geometry of aerial photographs, characteristics of geologic and topographic features identifiable from aerial photographs, and site characteristics related to soil profile. Laboratory work includes soil mapping, selection of construction sites, and location of soil deposits for engineering purposes. *Preq:* Junior standing.

419, 619 General Photogrammetry 3(2,3)S Fundamentals of mapping using aerial photographs; characteristics, production and use of aerial photographs; study of the operation of popular photogrammetric instruments including aerial cameras, stereoscopic viewing and plotting equipment; use of stereocomparagraph and multiplex plotting instruments; scale, tilt, and coordinate calculations; construction of photomosaics. *Preq:* Junior standing.

422 Hydraulics and Hydrology 3(3,0) Concepts of open channel flow; flow measurement; design of stable open channels; design of pump systems; precipitation; runoff; hydrograph analysis; flood routing; and hydrologic design. *Preq:* EM 320.

423, 623 Applied Hydrology 3(2,3) Introduction to the elements of occurrence of water; hydrologic cycle, rainfall runoff relations, evaporation, transpiration, streamflow; probability concepts in hydrology; flood routing; stormwater detention and conveyance systems; groundwater flow. Emphasis will be on application and design. The laboratory will include design of components of storm drainage or other water conveyance facilities. *Preq:* E M 320.

425 Civil Engineering Project Evaluation 3(3,0) Comparison of design alternatives based on engineering economic analysis. Introduction of present worth, annual worth, and rate of return methods. Use of depreciation and taxation in project analysis. Examines sensitivity and benefit-cost-ratio analysis. Consideration of inflation in cost analysis. Other topics include engineering societies, professionalism, ethical considerations, engineering registration.

431, 631 Applied Soil Mechanics 3(3,0) Relationship of local geology to soil formations, groundwater, planning of site investigation, sampling procedures, determination of design parameters, foundation design and settlement analysis. *Preq:* C E 330.

432, 632 Construction Project Administration 3(3,0) Development of fundamental concepts involved in the technical management of the construction phase of engineering projects. *Preq:* C E 324 or equivalent.

433, 633 Construction Planning and Scheduling 3(3,0) Principles and applications of the Critical Path Method (CPM) and Project Evaluation and Review Techniques (PERT). Project breakdown and network graphics. Identification of the critical path and resulting floats. Definition and allocation of materials, equipment, and manpower resources. Resource leveling, compression, and other network adjustments. Computer applications using packaged routines. *Preq:* C E 324 or equivalent.

434, 634 Construction Estimating and Project Control 3(3,0) Specifications, contracts, and bidding strategies. Purchasing and subcontracting policies. Accounting for materials, supplies, subcontracts, and labor. Procedural details for estimating earthwork, reinforced concrete, steel, and masonry. Overhead and profit items. *Preq:* C E 324 or equivalent.

435, 635 Engineering Project Analysis 3(3,0) Advanced analysis of engineering projects. Theory of economic, financial and intangible analysis of large-scale construction projects. Practical exercises in cost-benefit studies and construction decisions. *Preq:* Consent of instructor.

438, H438, 638 Construction Support Operations 3(3,0) Description of activities necessary for the completion of a construction job although not specifically recognized as direct construction activities. General conditions, safety, security, quality assurance, value engineering. Organizational support features and typical implementation procedures. *Preq:* C E 324 or equivalent and EX ST 301.

439, 639 Construction Equipment Selection and Maintenance 3(3,0) Methodology of selecting the right equipment of the right size for each task of the construction job on the basis of power-train characteristics, crew size, terrain conditions, and job requirements. Cycle time, cost, specifications, maintenance, replacement policy, monitoring. *Preq:* C E 324 or equivalent.

453, 653 Structural Analysis II 3(3,0) Analysis of statically indeterminate structures, including continuous beams, trusses and frames by virtual work, Castigliano's theorems, three-moment equation, moment distribution, and slope deflection. Influence lines for statically indeterminate structures. Muller-Breslau principle. Approximate methods for indeterminate frames. Solution of indeterminate trusses and frames using microcomputers. Introduction to matrix structural analysis. *Preq:* C E 301, 305.

462, 662 Coastal Engineering I 3(3,0) Introduction to coastal and oceanographic engineering principles, including wave mechanics, wave-structure interaction, coastal water-level fluctuations, coastal-zone processes, and design considerations for coastal structures and beach nourishment project. *Preq:* E M 320.

464, 664 Physical Models in Fluid Mechanics 3(2,2) Classical techniques of dimensional analysis and similitude are presented for fluid mechanics problems with actual construction of an operating physical model to solve a practical engineering problem. Problem will be chosen from the areas of coastal engineering, waste-heat disposal, water quality, and river mechanics. Experimental design and instrumentation will be covered in detail. *Preq:* E M 320.

480, 680 Wind Engineering 3(2,2) Study of the effects of wind forces on buildings, bridges, and other structures, including meterological aspects of wind generation, aerodynamics of flow around buildings, structural responses and environmental flows. *Preq:* C E 301, E M 320.

482, 682 (E S E) Groundwater and Contaminant Transport 3(3,0) See E S E 482.

490, H490, 690 Special Projects 1-3(1-3,0) Studies or laboratory investigations on special topics in civil engineering field which are of interest to individual students and staff members. Arranged on a project basis with a maximum of individual student effort and a minimum of staff guidance. May be repeated for a maximum of 3 credits. *Preq:* Senior standing.

801 Matrix Methods of Structural Analysis 3(3,0)

802 Prestressed Concrete Analysis and Design 3(3,0)

803 Reinforced Concrete Structural Systems 3(3,0)

804 Theory of Plates and Shells 3(3,0)

805 Plastic Analysis and Design of Steel Structures 3(3,0)

806 Metal Compression Members 3(3,0)

807 Numerical and Approximate Methods in Structures 3(3,0)

808 Finite Element Method in Engineering 3(3,0)

810 Dynamic Analysis of Structures 3(3,0)

811 Highway Geometric Design 3(2,3)

812 Airphoto Interpretation II 3(2,3)

813 Highway and Airport Pavement Design 3(3,0)

814 Traffic Flow Theory 3(3,0)

815 Transportation Safety Engineering 3(3,0)

816 Highway Planning 3(3,0)

817 Mass Transit Planning 3(3,0)

818 Airport Planning and Design 3(3,0)

819 Transportation Research 2-4(2-4,0)

823 Asphalt Concrete Properties 3(3,0)

824 Construction and Performance of Concrete 3(3,0)

830 Advanced Soil Mechanics 3(3,0)
831 Foundation Engineering 3(3,0)
832 Reliability Analysis and Design in Civil Engineering 3(3,0)
833 Analysis and Design of Deep Foundations 3(3,0)
835 Construction Project Modeling 3(3,0)
836 Construction Quality Management 3(3,0)
837 Construction Specifications and Contracts 3(3,0)
838 Materials Management 3(3,0)
839 Expert Systems Applications in Civil Engineering 3(3,0)
840 Project Management Applications 3(3,0)
846 Flow in Open Channels 3(3,0)
852 (E M) Finite Element Analysis in Solid Mechanics 3(3,0)
860 Advanced Fluid Mechanics 3(3,0)
861 Mechanics of Sediment Transport 3(2,2)
862 Heat Transfer at Water Surfaces 3(3,0)
863 Coastal Engineering II 3(3,0)
865 Hydrologic Systems Analysis 3(3,0)
866 Advanced Hydrologic Systems Analysis 3(3,0)
871 Coastal Hydrodynamics 3(3,0)
872 Marine Pollution Control 2(2,0)
875 Numerical Models and Hydraulics 3(3,0)
889 Special Problems I 1-3(1-3,0)
890 Special Problems II 1-3(1-3,0)
891 Master's Research. Credit to be arranged.
893 Selected Topics in Civil Engineering 1-6(1-6,1-6)
895 Civil Engineering Seminar 1(1,0)
991 Doctoral Research. Credit to be arranged.

COACHING EDUCATION (C ED)

349 Introduction to Coaching 3(3,0) Investigation into the scientific basis of the coaching profession. Topics of exploration include physiology, kinesiology, and psychology as well as administration of an athletic program.

350 Scientific Basis of Coaching I: Exercise Physiology 3(3,0) Designed to increase understanding of basic scientific information concerning athletic performance by using the conceptual approach. In-depth investigation into the physiological principles that can enhance athletic performance will be the primary focus. Phases of physical training as well as comprehensive evaluative techniques will be included. *Preq:* C ED 349.

352 Scientific Basis of Coaching II: Kinesiology 3(3,0) Designed to increase the student's understanding of basic scientific information concerning athletic movement by utilizing the conceptual approach. Deals with the basic laws of human motion necessary in evaluation of athletic movement, utilizing joint structure and anatomic landmarks as a basis for motion. *Preq:* C ED 349.

353 Theory of Prevention and Treatment of Athletic Injuries 3(2,3) Designed to increase the student's understanding of principles involved in the prevention and treatment of athletic injuries. Deals with basic anatomy, first aid, and diagnostic techniques necessary for the understanding of basic athletic training procedures. *Preq:* C ED 349.

361 Administration and Organization of Athletic Programs 3(3,0) Study of modern techniques and practices used in administering athletic programs. Major emphasis areas such as practice and game organization, purchase and care of equipment, bud-

get and finances, public relations, and legal liability in athletic programs are presented. *Preq:* C ED 349.

362 Psychology of Coaching 3(3,0) Study of psychological techniques utilized to promote maximum athletic performance. Areas of emphasis include motivation, coaching philosophy, athletic personality, mental preparation, and goal-oriented behavior. Not open to students who have taken C ED 342. *Preq:* C ED 349.

371 Coaching Baseball 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of baseball by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific level of competition. *Preq:* C ED 349.

372 Coaching Basketball 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of basketball by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* C ED 349.

373 Coaching Cross Country 1(0,3) Designed to increase understanding of technical and practical information concerning the coaching of cross country by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* C ED 349.

374 Coaching Football 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of football by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* C ED 349.

375 Coaching Soccer 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of soccer by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* C ED 349.

376 Coaching Strength and Conditioning 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of strength and conditioning by utilizing the conceptual approach. Students will study basic principles of coaching, training program, and equipment appraisal as a means to improve athletic performance. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* C ED 349.

377 Coaching Track and Field 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of track and field by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development also will be covered as it pertains to specific levels of competition. *Preq:* C ED 349.

378 Coaching Volleyball 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of volleyball by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* C ED 349.

379 Coaching Wrestling 1(0,3) Designed to increase understanding of basic technical and practical information concerning the coaching of wrestling by utilizing the conceptual approach. Students will study basic principles of coaching, competitive organi-

zation, and proper technical skills needed to improve athletic performances. Total program development will also be covered as it pertains to specific levels of competition. *Preq:* C ED 349.

453, 653 Athletic Injuries: Prevention, Assessment and Rehabilitation 3(3,0) Designed to give the student an understanding of prevention, treatment, and rehabilitation procedures of injured athletes. *Preq:* C ED 349.

711 Measurement and Evaluation in Sports 3(3,0)

721 Sports Law 3(3,0)

751 Physiology of Training the Athlete 3(3,0)

752 Advanced Skill Analysis in Sports 3(3,0)

761 Organization and Administration of Physical Education and Athletic Programs 3 (3,0)

762 Psychological Basis of Coaching 3(3,0)

765 Coaching Education Practicum I 3(1,6)

766 Coaching Education Practicum II 3(1,6)

COLLEGE OF EDUCATION (COLED)

480, 680 (AG ED, ED, IN ED) Educational Applications of Microcomputers 3(3,0) Introductory computer literacy course for teachers. Computer-assisted instruction, software, hardware, and educational applications will be covered. *Preq:* Senior standing/ graduate in Education.

482, 682 (AG ED, ED, IN ED) Advanced Educational Applications of Microcomputers 3 (2,2) Course is designed to provide students with the knowledge and skills needed to apply microcomputer technology to the utilization and generation of educational software in accordance with sound educational principles. *Preq:* COLED (AG ED, ED, IN ED) 480.

COMMUNITY AND RURAL DEVELOPMENT (C R D)

(See courses listed under Agricultural and Applied Economics)

Professors: B. L. Dillman, M. S. Henry, J. C. Hite, E. L. McLean, C. M. Sieverdes

357 Natural Resources Economics 3(3,0)F The principles and problems involved in the use of soil, water, forest, and mineral resources, with special emphasis on economic aspects of alternative methods of resource utilization. *Preq:* AP EC 202, ECON 200 or 211.

361 Introduction to Health-Care Economics 3(3,0) Introductory course in which students learn the basic economics of the institutions comprising the health-care industry. Topics include the underlying supply, demand, and institutional factors impacting health-care availability and cost of health care.

411, 611 (AP EC) Regional Impact Analysis 2(2,0)F Techniques for analysis of the growth and decline of regions including economic-base theory, shift share, regional input-output, regional econometric models, and fixed impact models. *Preq:* AP EC 202 or ECON 211 and 212.

412, 612 (AP EC) Spatial Competition and Rural Development 3(3,0)S Development of rural economic activity in the context of historical, theoretical, and policy aspects of friction associated with spatial separation. Location factors, transfer costs, location patterns, and regional-growth policy are considered. *Preq:* AP EC 202 or ECON 211 or equivalent.

491 (AP EC) Internship, Agribusiness, and Community and Rural Development 1-6 (0,2-12) Internship under faculty supervision in an approved agency or firm. An internship is designed to provide students with work experience in agribusiness or community and rural development. Student will submit a comprehensive report within one week of the end of the internship. A maximum of 6 internship credits may be earned. *Preq:* Junior standing and/or consent of instructor.

COMPARATIVE LITERATURE (C LIT)

403 Modern Studies 3(3,0) Comparative studies in modern literature. *Preq:* Two years study of a foreign language and 6 credits in literature.

COMPUTER ENGINEERING

(See Electrical and Computer Engineering)

COMPUTER SCIENCE (CP SC)

Professors: R. M. Geist III, S. T. Hedetniemi, *Acting Head;* E. W. Page III, J. C. Peck, A. J. Turner, Jr.; *Associate Professors:* H. C. Grossman, S. M. Hedetniemi, D. P. Jacobs, J. D. McGregor, A. W. Madison, R. P. Pargas, M. K. Smotherman, D. E. Stevenson, J. M. Westall, Jr.; *Assistant Professors:* P. J. Bernhard, E. O. Hare, M. J. Harold, T. D. Korson, B. A. Malloy; *Instructors:* A. A. McRae, R. H. Untch; *Lecturers:* R. L. Bender, A. C. Connor, J. F. Passafiume, C. F. Pellerin, H. A. Pellerin; *Visiting Assistant Professors:* G. A. Tagliarini, D. J. Poling

101, H101 Computer Science I 4(3,2) Introduction to modern problem solving and programming methods. Special emphasis is placed on algorithm development and software life cycle concepts. A general survey of basic hardware and software concepts is included. Intended for students who plan to concentrate in computer science or a related field. *Preq:* MTHSC 105 or satisfactory score (550) on the Mathematics Test, Level II (standard) or consent of instructor.

102, H102 Computer Science II 4(3,2) Continuation of CP SC 101, with continued emphasis on problem solving and program development techniques. Typical numerical, nonnumerical, and data processing problems will be examined. Basic data structures will be introduced. *Preq:* CP SC 101.

105 Essential Computer Skills 1(0,2) Computer literacy, user environments, and software packages for education. Credit may not be received for both CP SC 105 and 120.

110, H110 Elementary Computer Programming 3(3,0) Introduction to computer programming and its use in solving problems, intended primarily for technical majors. The FORTRAN programming language will be used. (Credit may not be received for both CP SC 110 and 150.)

120 Introduction to Information Processing Systems 3(2,2) Introduction to the techniques, principles, and concepts of modern information processing systems and microcomputers, intended primarily for nontechnical majors. Topics include information processing packages and applications, usage of typical information processing packages, digital computers, programming fundamentals and languages, and implementation of computer programs. Credit may not be received for both CP SC 105 and 120.

130 Data Processing with Cobol 3(3,0) Introduction to data processing techniques and applications. Emphasis is placed on the organization and processing of data files. The COBOL programming language is used. *Preq:* CP SC 110 or 120, or equivalent.

150 Introductory FORTRAN Programming 1(1,0) Introduction to computer programming in the FORTRAN programming language. Credit may not be received for both CP SC 110 and 150. *Preq:* Knowledge of a computer programming language.

151 Introductory PL/I Programming 2(2,0) Introduction to computer programming in the PL/language. *Preq:* Knowledge of a computer programming language.

152 Introductory Pascal Programming 2(2,0) Introduction to computer programming in the Pascal language. *Preq:* Knowledge of a computer programming language.

154 Introductory Snobol Programming 1(1,0) Introduction to computer programming in the Snobol language. *Preq:* Knowledge of a computer programming language.

155 Introductory RPG Programming 1(1,0) Introduction to computer programming in the RPG language. *Preq:* Knowledge of a computer programming language.

156 Introductory Basic Programming 1(1,0) Introduction to computer programming in the Basic language. *Preq:* Knowledge of a computer programming language.

157 Introduction to C Programming 1(1,0) Introduction to computer programming in

the C programming language. Credit may not be received for both CP SC 157 and 260. *Preq:* Knowledge of a computer programming language.

158 Introductory Modula-2 Programming 1(1,0) Introduction to computer programming in the Modula-2 programming language. *Preq:* Knowledge of a high-level computer programming language.

210, H210 Programming Methodology 4(3,2) Introduction to programming techniques and methodology. Topics include structured programming, stepwise refinement, program design and implementation techniques, modularization criteria, program testing and verification, basic data structures, and analysis of algorithms. Credit may not be received for both CP SC 102 and 210. *Preq:* CP SC 110 or 130, or ENGR 180, or equivalent.

220 Microcomputer Applications 3(3,0) Applications of microcomputers to formulate and solve problem models. Emphasis will be placed on applications development in database and spreadsheet environments. Current software products will be used. *Preq:* CP SC 120 or MGT 399 or equivalent experience.

230 Assembly Language Programming 3(3,0) Introduction to computer organization, machine language, and assembly language programming. The organization, machine language and assembly language of the IBM 370 will be studied. Credit may not be received for both CP SC 230 and 231. *Preq:* CP SC 101 or 110, or equivalent.

231, H231 Computer Science III 4(3,2) Study of the machine architectures on which algorithms are implemented; requirements of architectures that support high-level languages, programming environments, and applications. Credit may not be received for both CP SC 230 and 231. *Preq:* CP SC 102 or 210; or equivalent.

240, H240 Introduction to Data Structures 3(3,0) Basic concepts of data structures such as queues, stacks, and lists. Course includes the study of algorithms for the manipulation of data structures, the implementation of these algorithms in existing programming languages, and applications such as storage allocation and garbage collection. Credit may not be received for both CP SC 240 and 241. *Preq:* CP SC 102 or 210. *Coreq:* MTHSC 119.

241, H241 Computer Science IV 4(3,2) Study of the data structures and algorithms fundamental to computer science; abstract data-type concepts; measures of program running time and time complexity; algorithm analysis and design techniques. Credit may not be received for both CP SC 240 and 241. *Preq:* CP SC 102 or 210, MTHSC 119 or equivalent.

250 Advanced FORTRAN Programming 2(2,0) Continuing study of programming and problem solving using the FORTRAN language. Topics such as the use of data files and plotting will be included. *Preq:* CP SC 110, 120, or 150; or equivalent.

251 Advanced PL/1 Programming 2(2,0) Study of the advanced features of the PL/1 language. Topics such as file processing, dynamic storage allocation and compile-time facilities will be included. *Preq:* CP SC 151 or equivalent.

253 APL Programming 1(1,0) Introduction to computer programming in the APL language. *Preq:* CP SC 210 or consent of instructor.

255 Ada Programming Language 2(2,0) Advanced study of program design and problem solving using the Ada language. Topics such as packages, generics, and tasking will be covered. *Preq:* CP SC 102 or 210.

260 Production Systems Environment 3(3,0) Introduction to the environment typically encountered in large-scale data processing applications. Topics include the use of control languages to schedule the execution of programs and manage files. (Credit may not be received for both CP SC 157 and 260.) *Preq:* CP SC 102 or 210.

270 Fundamentals of Information Systems 4(3,2) Computer information systems in a large-scale computing environment will be used to address systems analysis and design, database management, data communication, and security of information. Reading knowledge of a business-oriented programming language will be developed. May not be counted for credit toward a Computer Science or Computer Information Systems degree. *Preq:* CP SC 120.

281 Selected Topics in Computer Science 1-4(0-3,0-6) Areas of computer science in

which new trends arise. Innovative approaches to a variety of problems in the use and understanding of basic computing concepts will be developed and implemented. *Preq:* Consent of instructor.

291 Seminar in Professional Issues I 1(1,0) The impact of computer use on society is considered. The ethical use of software and protection of intellectual property rights are discussed. The profession is viewed historically, organizations important to the profession are discussed, the development process for standards is presented, and the student is introduced to the professional literature. *Preq/Coreq:* CP SC 241 and consent of instructor.

330, H330 Computer Systems Organization 4(3,2) Introduction to the structure and programming of computer systems. Various hardware/software configurations are explored and presented as integrated systems. Topics include basic computer organization, input/output organizations, interrupt processing and system software. *Preq:* CP SC 231, E C E 201 and MTHSC 119.

331 Computer Systems Laboratory 1(0,2) Introduction to the systems programming environment; languages and interfaces for programming operating systems tasks; use of the C programming language and UNIX Operating system. *Preq:* CP SC 231 or equivalent.

332, H332 Computer Systems 3(3,0) Introduction to the design, integration, and use of hardware and software components in standard computer systems. Emphasis will be placed on computer organization at the component level, interfacing, basic operating system functions, and system utilities. Credit may not be received for both CP SC 332 and 422. *Preq:* CP SC 231. *Coreq:* CP SC 331.

340 Algorithms and Data Structures 3(3,0) Basic concepts of data structures such as queues, stacks, and lists. Methods of proof as they relate to program verification. Sets, functions, and relations as they relate to the analysis of algorithms. Course includes the study of algorithms, time complexity, and design techniques. Credit may be received for at most one of CP SC 240, 241, and 340. *Preq:* CP SC 102 or 210.

350 Foundations of Computer Science 3(3,0) Development of the theoretical fundations of programming, algorithms, languages, automata, computability, complexity, data structures, and operating systems; a broad range of fundamental topics is consolidated and extended in preparation for further study. *Preq:* CP SC 240, 241, MTHSC 119.

360 Peripherals and File Design 3(3,0) Study of peripheral devices and data management as a basis for the design of information systems. Traditional data processing applications will be presented and evaluated in terms of efficiency and effectiveness. Problems using standard file organization and access techniques will be assigned. *Preq:* CP SC 241 or consent of instructor.

361 Data Management Systems Laboratory 1(0,2) Introduction to mainframe environments typical of large-scale data processing applications; programming languages, control languages, and file utilities; use of COBOL language and IBM JCL. *Preq:* CP SC 102 or 210; or equivalent. *Coreq:* CP SC 360.

371 Systems Analysis 3(3,0) Incorporates a study of the decision-making process at all levels with the logical design of information systems. Extensive study of the system life cycle with emphasis on current as well as classical techniques for describing data flows, data structures, file design, etc. *Preq:* CP SC 360.

372 Introduction to Software Development 3(3,0) Techniques and issues in software design and development; tools, methodologies, and environments for effective design, development, and testing of software; organizing and managing the development of software projects. *Preq:* CP SC 241 or equivalent.

405, 605 Introduction to Graphical Systems Design 3(3,0) Principles, computational techniques, and design concepts needed for designing systems for effective graphical displays. *Preq:* MTHSC 108, 311; CPSC 241, 360.

422, H422, 622 Introduction to Operating Systems 3(3,0) Detailed study of the management techniques for the control of computer hardware resources. Topics include interrupt systems, primitive level characteristics of hardware and the management of memory, processor, devices, and data. Credit may not be received for both CP SC 332 and 422. *Preq:* CP SC 230, 231; CP SC 360. *Coreq:* CP SC 331.

423, H423, 623 Implementation of Operating Systems 3(2,2) Detailed review of the implementation of an existing, multi-tasking operating system. Extension of concepts in laboratory to development and implementation of a system nucleus supporting multitasking and process coordination on an actual computer system. Emphasis is given to design decisions as they apply to performance and complexity. *Preq:* CP SC 332 or 422, or equivalent.

428, H428, 628 Design and Implementation of Programming Languages 3(3,0) Overview of programming language structures and features and their implementation. Control and data structures found in various languages will be studied. Runtime organization and environment and implementation models will also be included. *Preq:* CP SC 231 and 241 or equivalent.

429, H429, 629 Translation of Programming Languages 3(3,0) Techniques and considerations for compiling and interpreting programming languages. Topics include scanning, parsing, optimization, code generation and their theoretical foundations. The implementation of a compiler or a major component of a compiler normally will be a term project. *Preq:* CP SC 422, 428.

430, 630 Computer Performance Evaluation 3(3,0) Computer hardware and software measure and evaluation in selection and improvement. Topics include measurement tools, analytic and simulation models, workload models, and program performance. *Preq:* CP SC 332 or 422 and MTHSC 301; or equivalent.

435, 635 Microprogramming 3(3,0) Software development at the microprogram level. Topics include organization of microprogrammed computers, emulation, interpreter design, and high-level language support. A survey of microprogrammable machines is also included. *Preq:* CP SC 330 and 422; or consent of instructor.

450, H450, 650 Theory of Computation 3(3,0) Introduction to models of computation and machine description languages, including finite-state automata and regular expressions, pushdown automata and context-free languages, and Turing machines and recursive functions. Topics include equivalence and relative computing power of the models studied, enumeration, Church's thesis, and undecidability problems. *Preq:* CP SC 350.

462, H462, 662 Database Management Systems 3(3,0) Introduction to database/data communications concepts as related to the design of online information systems. Problems involving structuring, creating, maintaining, and accessing multiple-user data bases will be presented and solutions developed. Comparison of several commercially available teleprocessing monitor and database management systems will be made. *Preq:* CP SC 360 and MTHSC 119.

463, 663 Online Systems 3(3,0) Provides an indepth study of the design and implementation of transaction processing systems and an introduction to basic communications concepts. A survey of commercially available software and a project using one of the systems are included. *Preq:* CP SC 462.

464, 664 Introduction to Computer Architecture 3(3,0) Survey of von Neumann computer architecture at the instruction-set level. Fundamental design issues will be emphasized and will be illustrated using historical and current mainframe, supermini, and micro architecture. *Preq:* CP SC 330 or consent of instructor.

472, H472, 672 Software Development Methodology 3(3,0) Advanced topics in software development methodology. Techniques such as chief programmer teams, structured design and structured walk-throughs will be discussed and used in a major project. The emphasis of this course is on the application of these techniques to large-scale software implementation projects. Additional topics such as mathematical foundations of structured programming and verification techniques will also be included. *Preq:* CP SC 360 and 372.

480, 680 Fundamentals of Computer Science 3(3,0) Fundamental concepts of computers and programming, intended primarily for Computer Science graduate students without an undergraduate degree in Computer Science. Topics include machine organization, assembly language programming systems, and data management. May not be taken by those who have completed CP SC 230. *Preq:* Expertise in programming a high-level language and consent of instructor.

481, H481, 681 Selected Topics 1-3(1-3,0) Areas of computer science in which nonstandard problems arise. Innovative approaches to problem solutions which draw from a variety of support courses will be developed and implemented. Emphasis will be placed on independent study and projects. May be repeated for a maximum of 6 credits, but only if different topics are covered. *Preq:* Consent of instructor.

491 Seminar in Professional Issues II 1(1,0) The impact of computing system development on society is considered. Ethical issues in the design and development of computer software are discussed. Standards for professional behavior, the professional's responsibility to the profession, and techniques for maintaining currency in a dynamic field are discussed by students. *Preq:* Senior standing.

740 Computer Science for High School Teachers I 3(2,2)

741 Computer Science for High School Teachers II 3(2,2)

805 Advanced Modeling Techniques in Computer Graphics 3(3,0)

810 Introduction to Artificial Intelligence 3(3,0)

820 Parallel Architecture 3(3,0)

823 Operating Systems Design 3(3,0)

824 Advanced Operating Systems 3(3,0)

825 Software Systems for Data Communications 3(3,0)

827 Introduction to Formal Languages 3(3,0)

828 Theory of Programming Languages 3(3,0)

829 Advanced Compiler Topics 3(3,0)

830 Systems Modeling 3(3,0)

838 Advanced Data Structures 3(3,0)

840 Design and Analysis of Algorithms 3(3,0)

841 Computational Complexity 3(3,0)

850 Recursive Function Theory 3(3,0)

862 Database Management Systems Design 3(3,0)

864 Computer Architecture 3(3,0)

872 Software Specification and Design Techniques 3(3,0)

873 Software Verification, Validation, and Measurement 3(3,0)

881 Selected Topics 1-3(1-3,0)

888 Directed Projects in Computer Science 1-6

891 Master's Research. Credit to be arranged.

951 Seminar in Algorithms 1-3(1-3,0)

952 Seminar in Computer Architecture 1-3(1-3,0)

953 Seminar in Database Systems 1-3(1-3,0)

954 Seminar in Operating Systems 1-3(1-3,0)

955 Seminar in Programming Language 1-3(1-3,0)

956 Seminar in Programming Paradigms 1-3(1-3,0)

957 Seminar in Software Engineering 1-3(1-3,0)

981 Seminar in Computer Science 1-3(1-3,0)

991 Doctoral Research. Credit to be arranged.

CONSTRUCTION SCIENCE AND MANAGEMENT (C S M)

Professors: C. L. Addison, N. L. Book, R. W. Liska, *Head; Associate Professors:* M. D. Egan, F. M. Eubanks; *Assistant Professors:* G. R. Corley, J. M. Mumford; *Visiting Assistant Professor:* K. A. Bingenheimer; *Visiting Instructor:* C. A. Piper

100 Introduction to Construction Science and Management 4(2,6) Introduction to the

principles, terminology, communication techniques, and computer applications of the construction industry.

201 Structures I 3(3,0) Study of statically determinate structures including force applications and distributions in structural elements and the resulting stress-strain patterns in axial, shear and bearing mechanisms. *Preq:* MTHSC 102 or 106, one semester science requirement.

202 Structures II 3(3,0) Study of the force distribution in statically determinate structures and structural elements including moment and shear stress, combined loading/stress conditions and deflections. *Preq:* C S M 201.

203 Materials and Methods of Construction 3(3,0) Theory and principles of building construction with an overview of how the major components of a building fit together and the rationale behind their construction. *Preq:* Sophomore standing. *Coreq:* C S M 100.

204 Contract Documents 3(2,3) Introduction to working drawings, specifications, and the various documents required to carry out a typical construction project. *Preq:* C S M 203, Construction Science and Management major, or consent of department head.

301 Structures III 3(3,0) Theory, analysis, and design of statically determinate steel and wood-structural components and systems; and introduction to reinforced concrete and reinforced masonry structures and systems. *Preq:* C S M 202.

302 Structures IV 3(3,0) Theory, analysis, and design of statically indeterminate steel, wood, and reinforced concrete structural components and systems and related structural concepts. *Preq:* C S M 301.

303 Soils and Foundations 3(2,3) Various types of soil will be studied, including related activities of testing, compaction, stability, and function. Various types of foundations will also be studied. *Preq:* C S M 202; Construction Science and Management major, or approval of department head.

304 Environmental Systems I 3(3,0) Theory of heating, ventilating, air conditioning, electrical, lighting and plumbing systems as related to building. *Preq:* Junior standing.

351 Construction Estimating 3(2,4) Basic estimating as applied to construction projects. Includes the take-off of material quantities, assigning labor and equipment production rates, and applying material prices, wage rates and equipment costs to derive a total job cost. *Preq:* C S M 204, Construction Science and Management major, or consent of department head.

352 Construction Scheduling 3(2,4) Analysis of construction projects with emphasis on estimating, scheduling, and resource leveling. *Preq:* C S M 351, Construction Science major, or consent of department head.

401 Formwork and Placing Concrete 3(3,0) Study of the design and construction of concrete formwork and concrete mixes. *Preq:* C S M 202; Construction Science and Management major, or approval of department head.

402 Construction Equipment and Safety Management 3(3,0) Selection, financing, and management of construction equipment. Study of the basics of construction safety management and controls. *Preq:* ACCT 203; Construction Science and Management major, or consent of department head.

403 Environmental Systems II 3(3,0) Theory of acoustical design and control, illumination, and life safety in buildings. *Preq:* Junior standing.

453 Construction Project Management 3(2,4) Study of construction business organization, methods of project delivery, field organization, policy, ethics, project management, control systems, labor management relations, and productivity. *Preq:* CSM 352, Construction Science and Management major, or consent of department head.

454 Construction Capstone 6(2,12) A terminal project will be accomplished that demonstrates a refinement of previous knowledge gained in technical, management, and general education courses. *Preq:* C S M 453, Construction Science and Management major, or consent of department head.

455, 655 Reducing Adversarial Relations in Construction 3(3,0) Course focuses on the study of the delivery of projects and how adversarial relations can affect the successful completion of the venture. Topics include the management of human resources, understanding the needs and processes of the participants, where the problems lie, methods of avoiding and settling disputes. *Preq:* Architecture and/or Construction Science and Management majors, or consent of instructor.

461 Construction Economics Seminar 3(3,0) Studies in the financial performance of construction companies. *Preq:* ACCT 203 and Senior standing, Construction Science and Management major, or consent of department head.

490, H490 Directed Studies 1-3(1-3,0) Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current development in construction science. May be taken for a maximum of 6 credits. *Preq:* Consent of instructor.

491 Construction Science and Management Internship 0 Eight hundred hours of verifiable construction-related experience.

498 Current Topics in Construction 1-3(1-3,0) Study of current topics in the construction industry not central to other construction science courses. Specific titles and course descriptions to be announced from semester to semester. May be taken for a maximum of 6 credits. *Preq:* Consent of adviser.

850 International Construction 6(0,18)

852 Construction Management Research 3(2,4)

860 Financial Planning and Analysis 3(3,0)

861 Construction Control Systems 3(3,0)

862 Personnel Management and Negotiations 3(3,0)

863 Advanced Scheduling 3(1,6)

864 Cost Analysis and Marketing 3(1,6)

865 Project Management 3(3,0)

871 Architectural Structures I 3(3,0)

872 Architectural Structures II 3(3,0)

875 Building Equipment and Systems 3(3,0)

876 Design for Natural Hazards 3(3,0)

877 Advanced Architectural Accoustics 3(3,0)

878 Lighting for Architecture 3(3,0)

881 Professional Seminar 3(3,0)

890 Directed Studies 3-6

891 Master's Research. Credit to be arranged.

899 Construction Science and Management Internship 0

ECONOMICS (ECON)

Professors: D. K. Benjamin, D. W. Blair, G. P. Dwyer, *Acting Head;* R. D. Elliott, C. M. Lindsay, R. E. McCormick, M. T. Maloney, R. D. Shannon, G. R. Thompson, H. H. Ulbrich, M. S. Wallace, J. T. Warner; *Associate Professors:* W. R. Dougan, D. L. Placone, R. D. Sauer, Jr., C. J. Simon; *Assistant Professors:* M. S. Gerety, C. Woo; *Visiting Assistant Professors:* E. M. Becker, A. V. Douglas; *Visiting Associate Professor:* D. B. Gordon

200 Economic Concepts 3(3,0)[1] Comprehensive course including both micro- and macro-economic concepts for the student not having theoretical course requirement beyond the principles level or for the student expecting to take a selected group of the 300-level courses in economics.

211, H211 Principles of Microeconomics 3(3,0) Intensive study of the economics of the

[1]Credit will not be given to students who previously have completed ECON 211 or 212.

firm, pricing of resources, and international economic relations. Theory is given relevance through the analysis of current economic problems.

212, H212 Principles of Macroeconomics 3(3,0) Fundamental principles of pricing, stabilization, and growth in a modern economy. Topics include supply and demand, employment theory and fiscal policy, banking systems and monetary policy, and economic growth.

301 Economics of Labor 3(3,0) Economics of the labor market, problems of the industrial worker, and methods of adjusting labor-management disputes. *Preq:* ECON 200 or 211, 212.

302, H302 Money and Banking 3(3,0) Considers the function of money and banking in both the product and financial markets. Special emphasis is placed on monetary theory and current problems of monetary policy. *Preq:* ECON 211 and 212, or 200 and consent of instructor.

304 (FIN) Risk and Insurance 3(3,0) See FIN 304.

305 (FIN) Investment Analysis 3(3,0) See FIN 305.

308 Collective Bargaining 3(3,0) Practices, procedures, legal foundations, and legal structure associated with collective bargaining. Form and content of the labor contract, grievance machinery, and mediation and arbitration institutions will also be studied. *Preq:* ECON 200 or 211.

309 Government and Business 3(3,0) Relationships between government and business, including among other topics, government efforts to enforce competition; to regulate public utilities; and to protect the special interest of laborers, farmers, and consumers. *Preq:* ECON 200 or 211.

310 The International Economy 3(3,0) Study of the process of international commerce. Covers basic theory of trade and exchange rates, institutional and legal environment, current policy issues. Not open to students who have taken ECON 412. *Preq:* ECON 200 or 211 or consent of the instructor.

314, H314 Intermediate Microeconomics 3(3,0) Analytical study of the basic concepts of value and distribution under alternative market conditions. *Preq:* ECON 211 or 200 and consent of instructor.

315, H315 Intermediate Macroeconomics 3(3,0) Formerly ECON 407. Macroeconomic problems of inflation and unemployment form the focal points. Statistics (GNP and the Consumer Price Index) and theory (Classical, Keynesian, and Monetarist views) will be included. Pertinent public policies designed to deal with these problems will be analyzed. *Preq:* ECON 200 or 212.

319 Environmental Economics 3(3,0) Study of the application of economic logic to issues surrounding environmental management and policy. The course examines individual, firm, and collective decision making as well as the evolution of regulatory approaches for controlling environmental use. *Preq:* ECON 314.

402 (LAW) Law and Economics 3(3,0) See LAW 402.

403, 603 Development of Economic Thought 3(3,0) Study of the origin and evolution of economic ideas with some emphasis on historical context, problems which inspired these ideas, and nature of the solutions which they provided from ancient days to the present. *Preq:* ECON 200 or 211, 212.

404, 604 Comparative Economic Systems 3(3,0) A comparative analytical and historical study of the principal economic systems which have been important in the modern world including among others, capitalism and socialism. *Preq:* ECON 200 or 211.

405, 605 Introduction to Econometrics 3(3,0) Formerly ECON 311. Elements of time series analysis and introduction to the measurement, specification, estimation and interpretation of functional relationships through single equation least square techniques. Problems of multicollinearity, dummy variables, heteroscedasticity, autocorrelation, and lagged variables in simple economic models are introduced.

408, 608 Arbitration 3(3,0) Analysis of dispute settlement procedures with specific emphasis on mediation, factfinding, and arbitration as they are used to resolve labor-management disputes in the public and private sectors. *Preq:* Consent of instructor.

409, 609 (MGT) Managerial Economics 3(3,0) Use of tools of economic analysis in classifying problems, in organizing and evaluating information, and in comparing alternative courses of action. Bridges the gap between economic theory and managerial practices. *Preq:* MA SC 310 or ECON 405, or consent of instructor.

410, 610 Economic Development 3(3,0) Consideration and analysis of economic and related problems of underdeveloped countries. Attention will be given to national and international programs designed to accelerate solution of these problems. *Preq:* ECON 200 or 211, 212.

412, H412, 612 International Microeconomics 3(3,0) Analysis of the principles governing trade between nations. Topics include comparative advantage, theory and practice of commercial policy, introduction to exchange rates, and balance of payments. Not open to student who have taken ECON 310. *Preq:* ECON 211, 212, and 314 or consent of instructor.

413 International Macroeconomics 3(3,0) Macroeconomic problems of unemployment and inflation will be examined from the perspective of a national economy which is linked to and not independent of the world economy. *Preq:* ECON 211 and 212.

419, 619 Economics of Defense 3(3,0) Examines the American defense establishment in terms of resources utilized, alternative uses, and the contribution to the national economy and scientific progress generated by resources in a defense use. Discussed are economic problems inherent in shifting resources between defense and nondefense uses and among alternative defense uses. *Preq:* ACCT 200 or 201, ECON 200 or 211.

420, H420, 620 Public Sector Economics 3(3,0) Study of the role of government and its proper functions and limitations in a market. Provision of goods and services by all levels of government and instruments of taxation are evaluated according to efficiency and equity criteria. Contemporary public sector issues are emphasized throughout. *Preq:* ECON 314 or consent of instructor.

422, H422, 622 Monetary Theory and Policy 3(3,0) An intensive study of the role of monetary factors in economic change. Modern monetary theories and their empirical relevance for policy are developed against a background of monetary history and institutions. *Preq:* ECON 302 or consent of instructor.

424, H424, 624 Organization of Industries 3(3,0) Empirical, historical, and theoretical analyses of market structure and concentration in American industry: the effects of oligopoly, monopoly, and cartelization upon price, output and other policies of the firm; antitrust and other public policies and problems will be studied. *Preq:* ECON 314 or consent of instructor.

430 Mathematical Economics 3(3,0) Traditional economic theories are derived using elementary mathematics. Major emphasis is placed upon microtheoretical models. Specialized topics such as cartel theory, national income analysis, price discrimination, and optimization theory over time will be economically analyzed, using mathematical tools. *Preq:* ECON 314, MTHSC 106.

498, H498 Current Topics in Economics 3(3,0) Discussion of current topics and research methods in economics. Students will write several short papers on current issues. *Preq:* Consent of instructor.

499, H499 Senior Seminar in Economics 3(3,0) Discussion of topics of current interest in economics. Students will do directed research on a particular topic. *Preq:* Consent of instructor.

750 Economic Concepts and Classroom Applications for Teachers 3(3,0)

751 Selected Topics for Teachers 3(3,0)

801 Microeconomic Theory 3(3,0)

802 Advanced Economic Concepts and Applications 3(3,0)

805 Macroeconomic Theory 3(3,0)

807 (MA SC) Econometric Methods I 3(3,0)

808 (MA SC) Econometric Methods II 3(3,0)

809 Mathematical Economics 3(3,0)

812 History of Economic Thought 3(3,0)
816 Labor Economics 3(3,0)
817 Public Employee Labor Relations 3(3,0)
820 Public Sector Economics 3(3,0)
824 Organization of Industry 3(3,0)
825 Economics of Environmental Quality 3(3,0)
826 Economic Theory of Government Regulation 3(3,0)
827 Economics of Property Rights 3(3,0)
831 Seminar in Urban Development Economics 3(3,0)
840 International Trade Theory 3(3,0)
841 International Finance 3(3,0)
850 Monetary Theory 3(3,0)
855 Financial Economics 3(3,0)
888 Directed Reading in Economics 1-3(1-3,0)
891 Master's Research. Credit to be arranged.
900 Seminar in Advanced Economic Theory 3(3,0)
901 (AP EC) Price Theory 3(3,0)
902 (AP EC) Production Economic Problems 2(2,0)
903 (AP EC) General Equilibrium and Welfare Theory 3(3,0)
904 (AP EC) Seminar in Resource Economics 3(3,0)
905 (AP EC) Advanced Macroeconomic Issues 3(3,0)
906 (AP EC) Seminar in Area Economic Development 3(3,0)
907 (AP EC) Agricultural Marketing Problems 2(2,0)
917 (AP EC) Advance Seminar in Labor Economics 3(3,0)
991 (AP EC) Doctoral Research. Credit to be arranged.

EDUCATION (ED)

Professors: R. L. Blackbourn, *Head;* I. C. Briscoe, S. L. Buckner, D. L. Fuhr, E. B. Galloway, G. W. Gray, R. P. Green, Jr., D. F. Keller, W. H. Leonard, R. K. Peden, W. W. Pennscott, J. C. Richardson, J. H. Walker, G. R. Weisenstein, J. F. Yukish; *Associate Professors:* D. E. Barrett, B. N. Cain, M. S. Crosby, W. R. Fisk, J. L. Flanigan, B. L. Griffin, L. B. Hart, K. N. Headley, R. A. Marion, T. I. Parks, M. D. Richardson, C. G. Weatherford; *Assistant Professors:* S. W. Barbary, G. A. Brigman, L. J. Curry, G. C. Delicio, M. J. Emery, F. O. Felder, T. J. Gaither, J. O. Krutilla, E. M. Owens, C. L. Peters, L. B. Reardon, D. A. Stevens, D. M. Switzer; *Lecturer:* N. S. Wilkinson; *Visiting Assistant Professors:* J. K. Weir, J. R. Wilson; *Visiting Instructor:* R. A. Kaminski

100 Orientation 1(1,0) Lectures and discussions on teaching in addition to serving as teacher aides. Required of all students in Early Childhood Education, Elementary Education, Secondary Education, and Science Teaching. To be taken Pass/Fail only.

101 Reading Improvement 1(0,3) Provides an individualized approach to developmental reading skills emphasizing comprehension, vocabulary, and rate.

102 Efficient Reading 1(0,3) Extends the reading skills of vocabulary, comprehension, and rate stressing skimming, scanning, flexibility, and critical reading.

103 Learning Strategies 2(3,0) Students learn strategies of active learning and critical thinking skills which become an integral part of their natural thinking processes. Students learn how to generalize and apply newly acquired strategies to a variety of settings and situations.

234 Introduction to Addictions: Basic Education and Prevention 3(3,0) Designed to give the student a basic review of addictions and chemical dependence and to give future ed-

ucators skills in the identification of chemical abuse, techniques for intervention, and methods of prevention education. SOC 395 is recommended as a follow-up course for those interested in pursuing the topic.

301, H301 Principles of American Education 3(3,0) Study of the legal basis, historical development, characteristics, and functions of educational institutions in the United States.

302, H302 Educational Psychology 3(3,0) Introduction to classroom use of objectives, motivation theories, learning theories, tests and measurements, classroom management, and knowledge of exceptional learners.

303 Classroom Testing 3(3,0) Analysis of proper creation of classroom tests, including how to construct good test items for all formats (multiple choice, true-false, essay, numerical problems, and many others). Introduction to standardized tests and their scores and interpretations. Analysis of grade-reporting strategies and formats. *Preq:* ED 100, 302.

315 (IN ED) Integrating Computers into the Classroom 1(0,2) Student will learn how to use microcomputers to supplement the classroom curriculum and to enhance classroom management. *Preq:* Admission to the College of Education; ED 301 and 302; fulfillment of the College of Education computer science requirement; or consent of instructor.

321 Physical Education for Elementary School: Games and Sports Skills 3(3,0) Values, purposes, and uses of creative games and games of low organization. Basic skills and lead-up activities for children. Methods of instruction and time allotments appropriate for elementary school programs. *Preq:* Junior standing Education major or consent of instructor.

334, H334 Child Growth and Development 3(3,0) Introduction to lifespan development. Heavy emphasis is placed on the physical, social, emotional, and cognitive characteristics of children under 12 and the educational implications of those developmental characteristics.

335, H335 Adolescent Growth and Development 3(3,0) Introduction to lifespan development. Strong emphasis is placed on the physical, social, emotional, and cognitive characteristics of the 10- to 18-year old and the educational implications of those developmental characteristics.

336, H336 Behavior of the Preschool Child 3(3,0) Study of the behavior of the preschool child from infancy through age 5. Theoretical concepts and observation of children's behavior are integrated, analyzed, and evaluated to discover implications for teaching and guiding preschool children. *Preq:* ED 334, a minimum grade-point ratio of 2.0 or consent of instructor.

371 Characteristics of the Mildly Handicapped 3(3,0) This course will survey the characteristics which distinguish the mildly/moderately handicapped from the more severely handicapped. *Preq:* Minimum grade-point ratio of 2.0.

400 Early Childhood Field Experience 1(0,3) Designed to provide practical classroom experience in early childhood education prior to the student teaching semester for the Early Childhood Education major. For a twelve-week period, students will spend two hours per week in schools observing, tutoring, conducting small group activities, and teaching the class. To be taken Pass/Fail only. *Preq:* ED 100, 334, 336, concurrent enrollment in ED 461, Junior standing, and minimum grade-point ratio of 2.0.

401 Elementary Field Experience 1(0,3) Designed to provide practical classroom experience prior to the student teaching semester for the Elementary Education major. For a twelve-week period, students will spend two hours per week in schools observing, tutoring individuals, conducting small group activities, and teaching the class. To be taken Pass/Fail only. *Preq:* ED 100, 334, concurrent enrollment in ED 461, Junior standing, and a minimum grade-point ratio of 2.0.

406, 606 Philosophy, Schooling, and Educational Policy 3(3,0) Analysis of the development of contemporary educational theory and its impact on current schooling practices and educational policy development.

412 Directed Student Teaching in Secondary School Subjects 12(1,33) A program of supervised observation and teaching in cooperation with selected public schools in which

opportunities are provided for prospective teachers to obtain experiences in the subject area. Students to be sectioned according to teaching fields: English, history, social science, mathematical sciences, modern languages, science. Enrollment is limited.

413 Directed Teaching in Special Education 12(1,33) This comprehensive course provides a full-time, semester-long experience for potential special education teachers preparing to work with mildly/moderately handicapped students. It is generally the last course experience that allows practice under the supervision of master teachers. *Preq:* ED 371, 491, 492, 493, 494, 496.

414, 614 (PRTM) Recreation and Leisure for Special Populations 3(3,0) See PRTM 414.

424 Methods and Materials in Secondary English 3(3,0) Development of instructional practices and materials appropriate for secondary English; familiarization with curriculum materials; includes field experiences in local schools in preparation for student teaching. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

425 Methods and Materials in Secondary Modern Language 3(3,0) Development of instructional practices and materals appropriate for secondary modern languages; familiarization with curriculum materials; includes field experiences in local schools. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

426 Methods and Materials in Secondary Mathematics 3(2,2) Development of instructional practices and materials appropriate for secondary mathematics; familiarization with curriculum materials; includes field experiences in local schools. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

427 Methods and Materials in Secondary Science 3(2,2)F Development of instructional practices and materials for teaching secondary school science (biological, earth and physical sciences); familiarization with secondary science curriculum materials; includes field experiences in local schools. *Preq:* Second semester Junior standing and 2.0 grade-point ratio.

428, H428 Methods and Materials in Secondary Social Studies 3(3,0) Development of instructional practices and materials appropriate for secondary social studies; familiarization with curriculum materials. For students enrolled in the professional block semester.

429, 629 Teacher As Manager 3(3,0) Course designed to help teachers, principals, and other school personnel solve school problems by identifying and applying selected management techniques, and to better prepare educators for responsibilities demanded of them by the movement to measurable improvement in their management of learning.

431, 631 Special Institute Course: Early Childhood Education 1-3(1-3,0) Subject areas organized according to institute needs.

432, 632 Special Institute Course: Elementary School 1-3(1-3,0) Subject areas organized according to institute needs.

433, 633 Special Institute Course: Secondary School 1-3(1-3,0) Subject areas organized according to institute needs.

434, 634 Special Institute Course: Current Problems in Education 1-3(1-3,0) Subject areas organized according to institute needs.

435, 635 Special Institute Course: Curriculum 1-3(1-3,0) Subject areas organized according to institute needs.

436, 636 Special Institute Course: Supervision and Administration 1-3(1-3,0) Subject areas organized according to institute needs.

440, 640 Advanced Physical Education Methods for the Classroom Teacher 3(3,0) Will help the experienced teachers in public schools expand their knowledge and understanding of physical education. *Preq:* ED 321 or equivalent.

451 Elementary Methods in Science Teaching 3(3,0) Development of process skills, technical skills, and attitudes needed to foster increased confidence and commitment to the teaching of elementary science, with emphasis on teaching strategies and techniques and their implications for what we know of how children learn science.

452 Elementary Methods in Mathematics Teaching 3(3,0) Special emphasis is given the development of understanding, skills, and attitudes in the elementary curriculum with

focus on strategies, techniques, and materials for teaching elementary mathematics.

458 Health Education 3(3,0) Study of the information needed for effective cooperation with parents, physicians, and public health agencies in the promotion and improvement of community health, including problems of personal hygiene, health records, immunization, and control of communicable disease.

459 Fundamental Skills for Reading Instruction 3(2,2) Study of language development, preschool and primary reading process, historical development of reading, and basic skills. Laboratory field experiences to be arranged with each individual.

461, H461, 661 Teaching Reading in the Elementary School 3(3,0) Study of various phases of reading and their relation to the elementary program. Emphasis on modern practices in the classroom teaching of reading. *Preq:* ED 301, 302, 336 (for Early Childhood majors), Junior standing, and a grade-point ratio of 2.0.

462, H462 Diagnostic and Corrective Reading 3(2,3) The purpose of this course is to prepare prospective classroom teachers for diagnosing and correcting reading problems. Laboratory field experiences will be arranged for each individual. *Preq:* ED 461 or consent of instructor, Senior standing, and a minimum grade-point ratio of 2.0.

466 Introduction to Early Childhood Education 3(3,0) Introductory course for Early Childhood Education, which includes an overview of curriculum for kindergarten and primary grades. *Preq:* ED 336 or concurrent enrollment, Junior standing, and a minimum grade-point ratio of 2.0.

469, 669 Characteristics of Children with Emotional Handicaps 3(3,0) Intensive study of the meaning and concepts associated with emotionally handicapped. Analysis of the causes and characteristics of emotionally handicapped. *Preq:* ED 302, or PSYCH 201 and ED 471, or consent of instructor.

470, 670 Characteristics of Children with Learning Disabilities 3(3,0) Nature and extent of perceptual, motor, and conceptual impairments are examined. Team functions, community role, and family needs are emphasized. *Preq:* ED 302, ED 471 and PSYCH 201, or consent of instructor.

471, H471, 671 The Exceptional Child 3(3,0) Survey of exceptionality including handicapped and gifted children; nature, cause and treatment of difficulties; educational problems.

472, 672 Psychology of Mental Retardation 3(3,0) Psychological aspects of mental retardation: learning, motivation, and personality development.

473, 673 Teaching the Mentally Retarded 3(3,0) Study, selection, and preparation of curricular materials, methods of teaching retarded children within the preadolescent and adolescent range. *Preq:* ED 472 or equivalent.

474, 674 Educational Procedures for Children with Emotional Handicaps 3(3,0) Major problems of teaching disturbed children: curriculum and instructional modifications, program planning, facility adaptation, behavior controls, articulation with mental health specialists, and procedures to develop readiness for return to regular class. *Preq:* ED 302, ED 471 and PSYCH 201, or consent of instructor.

475, 675 Educational Procedures for Children with Learning Disabilities 3(3,0) Special emphasis is given to educational evaluation and remedial procedures designed to improve the individual's learning abilities. A multisensory approach is emphasized geared to individual need. *Preq:* ED 302, ED 471 and PSYCH 201, or consent of instructor.

476, 676 Practicum in Learning Disabilities 3(2,3) Designed to provide practical experience in teaching the learning disabled under the supervision of college faculty and local teachers of learning disabilities. *Preq:* ED 470, 471, 475, or consent of instructor.

477, 677 Characteristics of Children Who Are Gifted 3(3,0) Course designed to acquaint the student with definitions, incidences, characteristics, identification procedures, and curriculum options for the gifted. *Preq:* ED 471.

478, 678 Practicum in Emotionally Handicapped 3(2,3) Designed to provide practical experience in teaching the emotionally disturbed under the supervision of college faculty and local teachers of emotionally handicapped. *Preq:* ED 469, 471, 474, or consent of instructor.

479, 679 Practicum in Mentally Retarded 3(2,3) Designed to provide practical experience in teaching the mentally retarded under the supervision of college faculty and local teachers of mentally retarded. *Preq:* ED 471, 472, 473, or consent of instructor.

480, 680 (AG ED, COLED, IN ED) Educational Applications of Microcomputers 3(3,0) See COLED 480.

481 Directed Teaching in the Elementary School 12(1,33) Supervised observation and teaching experiences in cooperation with selected elementary schools. Enrollment is limited to seniors or graduates who have completed prerequisite courses. *Preq:* ED 462, 485, 487, 488, Senior standing, a minimum grade-point ratio of 2.0, and consent of the area coordinator.

482, 682 (AG ED, COLED, IN ED) Advanced Educational Applications of Microcomputers 3(2,2) See COLED 482.

483 Methods and Materials for Early Childhood Education 3(3,0) Study of methods and materials applicable to nursery schools, kindergarten, and early elementary grades. *Preq:* ED 466, concurrent enrollment in ED 461, Junior standing, and a minimum grade-point ratio of 2.0.

484 Directed Teaching in Early Childhood Education 12(1,33) Supervised observation and teaching experiences in cooperation with nursery, kindergartens, and early elementary schools. Enrollment is limited to seniors or graduates who have completed prerequisite courses and have the accumulated grade-point ratio for graduation. *Preq:* ED 462, 466, 483, 488, Senior standing, a minimum grade-point ratio of 2.0, and consent of the area coordinator.

485 Methods and Curriculum in Elementary Mathematics and Science 3(3,0) Development of understanding, skills, and attitudes in the elementary mathematics and science curricula, with emphasis on strategies, techniques, and materials for teaching elementary mathematics and science. *Preq:* MTHSC 115, 116, 216, completion of the 12-hour science requirement, Junior standing, and a minimum grade-point ratio of 2.0.

487 Teaching Social Studies in the Elementary School 2(2,0) Provides the preservice teacher with an introduction to the skills of social studies and methods, materials, and techniques needed to teach these skills to students in the elementary school. *Preq:* HIST 172, 173, and the social science requirement.

488 Teaching the Language Arts in the Elementary School 3(3,0) Provides the preservice teacher with an introduction to the skills of the language arts other than reading and the methods, materials, and techniques needed to teach these skills to students in the elementary school. *Preq:* ED 301 and 302, ENGL 101 and 102, Junior standing and grade-point ratio of 2.0.

490, 690 Student Management and Discipline 3(3,0) Designed to aid preservice and in-service teacher development and to refine knowledge, skills, and values important for managing students in school settings. Practical application of theory and research and legal and ethical considerations will be emphasized. *Preq:* ED 302 or PSYCH 201 and ED 334 and 335 or suitable alternative.

491 Assessment of the Mildly Handicapped 3(3,0) Course designed to prepare students to assess the mildly handicapped elementary/secondary student. The prospective teacher also will be taught to implement other professional assessment techniques. *Preq:* ED 371.

492 Academic Skill Intervention for the Handicapped 3(3,0) Course will prepare prospective special education teachers to develop and implement special education programs in areas of academic study for the mildly/moderately handicapped student. *Preq:* ED 371 or consent of instructor.

493 Behavioral Skill Intervention for the Handicapped 3(3,0) Course will prepare prospective special education teachers to develop and implement special education programs in areas of behavioral intervention skills with the mildly/moderately handicapped. *Preq:* ED 371 or consent of instructor.

494 Teaching Reading to the Exceptional Child 3(3,0) Course designed to teach the theory and skills necessary for success in teaching reading to exceptional students. Focus

will be on the mildly/moderately handicapped student. *Preq:* ED 371, 461 or 498 or consent of instructor.

495 Role and Function of the Resource Teacher 3(3,0) Opportunities to study the role and function of successful special education resource teachers working with mildly/moderately handicapped students sharing similar learning styles. *Coreq:* ED 413.

496 Special Education Field Experience 3(1,6) Course provides theory and extensive practice for potential special education teachers preparing for working with mildly/moderately handicapped students prior to the directed teaching experience. *Preq:* ED 371. *Coreq:* ED 491, 492, 493, 494.

497, 697 Instructional Media in the Classroom 3(3,0) An integrated approach to the use of audiovisual media stressing systematic planning, selection, utilization, and evaluation as well as production of materials and equipment operation.

498, H498 Secondary Content Area Reading 3(1,4) Designed for preservice teachers who are involved with field experiences prior to student teaching full time. The course is designed to prepare content area teachers to teach the reading skills necessary for effective teaching of content area material. *Preq:* For students enrolled in the professional block semester.

700 (IN ED) Supervising the Student Teacher in the Public School 2-3(2-3,0)

701 Human Growth and Development 3(3,0)

702 Advanced Educational Psychology 3(3,0)

705 Foundations of Counseling and Guidance Services 3(3,0)

707 Reading and Independent Study in Education 1-3

710 Assessment in Higher Education 3(3,0)

720 School Personnel Administration 3(3,0)

721 Legal Phases of School Administration 3(3,0)

723 Field Experiences in Elementary Administration and Supervision 3(1,6)

724 Field Experiences in Secondary Administration and Supervision 3(1,6)

725 Practicum in School System Administration and Supervision 3(1,6)

740 Curriculum Planning for Early Childhood Education 3(3,0)

741 Student Development Services in Higher Education 3(3,0)

742 Theories of Student Development in Higher Education 3(3,0)

759 Fundamentals of Basic Reading 3(3,0)

760 Curriculum Development in the Elementary School 3(3,0)

761 Reading Instruction in the Elementary School 3(3,0)

762 Reading Diagnosis and Remediation 3(2,3)

763 Middle School Reading 3(3,0)

764 The Role of the Library in the Reading Program 3(3,0)

765 Secondary School Curriculum 3(3,0)

770 Methods for Science Laboratory Instruction 3(3,0)

778 Experimental and non-Experimental Methods in Educational Research I 3(3,0)

794 School and Community Relationships 3(3,0)

798 Teaching Secondary School Reading 3(3,0)

800 Foundations of Secondary School Counseling and Guidance 3(3,0)

803 Advanced Methods of Teaching in the Secondary School 3(3,0)

804 Advanced Methods of Teaching in the Elementary School 3(3,0)

805 The Two-Year College 3(3,0)

806 Foundations of Counseling in the Elementary School 3(3,0)

807 Counseling in Community Agency Setting 3(3,0)

808 Educational Tests and Measurements 3(3,0)
809 Analysis of the Individual 3(2,1)
810 Theories and Techniques of Counseling 3(3,0)
811 School Finance 3(3,0)
812 The School Counselor as Consultant 3(3,0)
813 Educational and Vocational Informational Service and Placement 3(3,0)
814 Field Experiences in Elementary School Guidance I 3(1,6)
815 Field Experiences in Secondary School Guidance I 3(1,6)
816 Field Experiences in Counseling in Post-Secondary Settings I 3(1,6)
817 Development of Counseling Skills 3(3,0)
818 Field Problems in School Administration and Instruction 3(2,3)
819 Advanced Counseling Techniques and Strategies 3(3,0)
820 Teaching Language Arts to the Exceptional Child 3(3,0)
821 Assessment of the Exceptional Child 3(3,0)
822 Teaching Mathematics to the Exceptional Child 3(3,0)
823 Mainstreaming the Handicapped 3(3,0)
824 Secondary Curriculum Adaptations for the Handicapped 3(3,0)
825 Career-Vocational Education for the Handicapped 3(3,0)
827 Program Administration and Leadership 3(3,0)
828 Field Experiences in Elementary School Guidance II 3(1,6)
829 Field Experiences in Secondary School Guidance II 3(1,6)
830 Techniques of Supervision: the Public Schools 3(3,0)
832 Field Experiences in Counseling in Post-Secondary Settings II 3(1,6)
834 Educational Evaluation 3(3,0)
835 Field Experiences in Counseling in Community Agency Settings I 3(1,6)
836 Field Experiences in Counseling in Community Agency Settings II 3(1,6)
840 Program Development and Implementation in Early Childhood Education 3(2,2)
841 Advanced Studies in Teaching Secondary School English 3(3,0)
842 Advanced Studies in Teaching Secondary School Mathematics 3(3,0)
843 Advanced Studies in Teaching Secondary School Science 3(3,0)
844 Advanced Studies in Teaching Secondary School Social Studies 3(3,0)
846 Current Literature in English Education 3(3,0)
847 Current Literature in Mathematics Teaching 3(3,0)
848 Current Literature in Science Teaching 3(3,0)
849 Current Literature in Social Studies Teaching 3(3,0)
850 Public School Administration 3(3,0)
851 The Principalship 3(3,0)
852 Organizational Theory for School Administrators 3(3,0)
853 Administration and Supervision of Special Education 3(3,0)
854 Advanced Educational Leadership: Theory and Practice 3(3,0)
855 Business Management in Education 3(2,3)
856 Introduction to School Building Planning 3(2,2)
857 Selected Topics in Educational Administration 1-3(1-3,0)
858 Curriculum Planning and Improvement for School Administrators 3(3,0)

861 Organization and Supervision of Reading Programs 3(3,0)

862 Clinical Research in Reading 3(3,0)

863 Practicum in Reading 3(2,2)

864 Special Problems in Reading Education 1-3(1-3,0-4)

865 Advanced Diagnosis and Remediation in Reading 3(2,3)

866 The Psychology of Teaching Reading 3(3,0)

867 Advanced Practicum in Reading 3(2,3)

868 Teaching Reading Through a Literature Emphasis 3(3,0)

869 The Reading-Writing Connection: An Integrated Approach 3(3,0)

870 Schooling as a Cultural Process 3(3,0)

871 Interpersonal and Group Relationships 3(3,0)

872 History of American Education 3(3,0)

875 Seminar in Human Growth and Development 3(3,0)

876 Seminar in Learning Theory and Environments 3(3,0)

878 Experimental and non-Experimental Research Methods in Education II 3(3,0)

879 Qualitative Research in Education 3(3,0)

881 Individual Testing I 3(3,0)

882 Psychoeducational Evaluator Internship I 3(0,6)

883 Psychoeducational Evaluator Internship II 3(0,6)

884 School Psychology 3(3,0)

885 Individual Testing II 3(3,0)

886 Individual Testing III 3(3,0)

887 Psychoeducational Internship III 3(1,6)

889 (AG ED, IN ED) Research in Education 3(3,0)

891 Master's Research. Credit to be arranged.

894 Directed Research 1-4

921 Legal Principles in the Administration of Institutions of Higher Education 3(3,0)

930 Advanced Studies in Foundations of Special Education 3(3,0)

931 Advanced Methods and Curriculum Development in Learning Disabilities 3(3,0)

932 Advanced Methods and Curriculum Development in Emotionally Handicapped 3 (3,0)

933 Advanced Methods and Curriculum Development in Mentally Handicapped 3(3,0)

934 Program Models, Evaluation, and Current Trends in Special Education 3(3,0)

953 Educational Policy Studies 3(3,0)

954 Curriculum Theory 3(3,0)

955 Theoretical Bases of Instruction 3(3,0)

ELECTRICAL AND COMPUTER ENGINEERING (E C E)

Professors: A. W. Bennett, C. M. Butler, T. L. Drake, D. J. Dumin, L. T. Fitch, B. E. Gilliland, A. A. Girgis, J. N. Gowdy, J. L. Hammond, J. W. Harrison, Jr., J. J. Komo, J. F. Leathrum, J. Y. Luh, E. B. Makram, L. W. Pearson, *Head;* K. F. Poole, R. J. Schalkoff, R. Singh, R. W. Snelsire, J. D. Spragins; *Associate Professors:* E. G. Baxa, Jr., J. E. Bennett, M. A. Bridgwood, A. S. Collins, D. L. Lubkeman, T. W. Morgan, F. R. Sias, Jr.; *Assistant Professors:* C. W. Baum, E. R. Collins, Jr., D. M. Dawson, Y. Guo, W. B. Ligon III, A. Q. Martin, J. W. Silvestro, D. W. Tipper, A. E. Turner, X. Xu; *Lecturers:* D. McAuliff, E. L. Sheppard; *Visiting Assistant Professor:* K. T. Vu

201 Logic and Computing Devices 3(2,2) Study of logic with an introduction to Boolean

algebra. Number systems and representation of information. The use of integrated circuits to implement combinational and sequential logic functions and computing elements. The organization and structure of computing systems. *Preq:* MTHSC 108, PHYS 122.

202, H202 Electric Circuits I 3(3,0) DC resistive circuits, Kirchhoff's Laws, Nodal and Mesh emphasis, sources, Thevenin's and Norton's theorems, RC, RL, RCL circuit solutions with initial condition using homogenous or nonhomogenous ordinary differential equations having constant coefficients. Develop sinusoidal steady state solution. *Preq:* MTHSC 108, PHYS 122. *Coreq:* E C E 203, PHYS 221.

203 Electrical Circuits Laboratory I 1(0,2) Laboratory course designed to accompany E C E 202. Introduction to basic electrical circuits and instrumentation. *Coreq:* E C E 202.

204 Circuit Analysis Problems I 1(0,3) Analysis and solution of electrical network problems using mesh and nodal analysis, Thevenin's and Norton's theorems and equivalent circuits and other circuit analysis from E C E 202. *Coreq:* E C E 202.

211 Electrical Engineering Laboratory I 1(0,2) Principles of measurement and instruments used to measure parameters and dynamic variables in electric circuits, steady state and transient measurements in DC and AC circuits, and data anyalysis methods are included. *Coreq:* E C E 202.

212 Electrical Engineering Laboratory II 1(0,2) Measurement techniques in AC steady-state circuits, and comparison to theoretical predictions are emphasized. Two-port network methodology and transfer functions are studied experimentally, and related to analysis using transform techniques. *Preq:* E C E 202, 211. *Coreq:* E C E 262.

262, H262 Electric Circuits II 3(3,0) Continuation of the study of electric circuits, including three-phase circuits, complex frequency and network functions, frequency response, two-port parameters, magnetically-coupled circuits, Laplace transforms, and introduction to Fourier series and transforms. *Preq:* E C E 202, MTHSC 206, PHYS 221. *Coreq:* E C E 212, MTHSC 208.

263 Circuit Analysis Problems II 1(0,3) Analysis of basic AC circuit analysis techniques to analyze the transient and steady-state behavior of both simple and complex circuits. *Coreq:* E C E 262, MTHSC 208.

272 Computer Organization 4(3,2) Introductory course in computer organization and architecture. Topics include basic hardware and software structure, addressing methods, programs control, processing units, I-O organization, arithmetic, main-memory organization, peripherals, microprocessor families, RISC architectures, and multiprocessors. *Preq:* E C E 201 and CP SC 157 or 210.

H300 Junior Honors Seminar 1(2,0) Course designed to acquaint students enrolled in the Electrical and Computer Engineering Departmental Honors Program with current research activities in the department. The faculty will provide seminars where research interests are summarized. Seminars are planned to prepare the students in choosing a research topic for their senior thesis.

302 Linear Control Systems 3(3,0) Introduction to linear control systems. Topics include plant representation, applications of state variables, time and frequency response, stability, system specification, and system design. *Preq:* E C E 262.

307 Basic Electrical Engineering 2(2,0) A first course in electrical engineering to provide non-Electrical Engineering majors with a knowledge of electric circuit theory, both DC and AC. The last five weeks of the semester are devoted to an introduction to digital systems. *Preq:* MTHSC 206, PHYS 221. *Coreq:* E C E 309.

308 Electronics and Electromechanics 2(2,0) Continuation of E C E 307. Energy conversion systems are considered, as well as basic electronics. *Preq:* E C E 307.

309 Electrical Engineering Laboratory I 1(0,2) A laboratory designed to accompany E C E 307. Basic electrical circuits and instrumentation. *Coreq:* E C E 307.

310 Electrical Engineering Laboratory II 1(0,2) A laboratory designed to accompany E C E 308. Basic electronics and energy conversion. *Coreq:* E C E 308.

311 Electrical Engineering Laboratory III 1(0,2) Measurements and characteristics of electronic devices and circuits; use of manual and automated instruments to acquire

data; statistical analysis of data; oral and written engineering reports. *Preq:* E C E 262, MTHSC 208, PHYS 221. *Coreq:* E C E 320.

312 Electrical Engineering Laboratory IV 1(0,2) Design and characterization of functional circuits using solid-state devices; use of manual and automated instruments for measurements; statistical analysis of data; and preparation of engineering reports. *Preq:* E C E 311, 320. *Coreq:* E C E 321.

317 Random Signal Analysis 3(3,0) Introduction to engineering problems of a probabilistic nature. Systems transformations, statistical averages, simulation, and estimation of system parameters. *Preq:* E C E 262, MTHSC 208. *Coreq:* E C E 330.

320 Electronics I 3(3,0) Introduction to electronic materials and devices. Principles of design. Design of DC and AC circuits using diodes, bipolar junction transistors, field-effect transistors and use of transistors in digital circuits. *Preq:* E C E 262, MTHSC 208, PHYS 221. *Coreq:* E C E 311.

321 Electronics II 3(3,0) Analysis and design of discrete amplifier circuits at low and high frequencies. Operational amplifiers, distortion in amplifiers, oscillator design, and circuit analysis of active digital devices. *Preq:* E C E 320. *Coreq:* E C E 312.

329 Computer Systems Structures 3(3,0) Fundamental structures and issues that arise in the analysis and implementation of computer systems. Topics include operating systems structures and data structures and their relationship to computer organization. Engineering science background for computer systems design. *Preq:* CP SC 210, 240, E C E 272.

330, H330 Signals, Systems, and Transforms 3(3,0) Systems models, analysis of signals, Fourier series and transforms, sampling and Z transforms, discrete Fourier transforms. *Preq:* E C E 262, MTHSC 208.

340 Electromagnetics I 2(2,0) Introduction to electrostatics with applications. Vector analysis, Coulomb's law and forces, electric field, Gauss's law, dielectrics, electric potential, Laplace's equation and solutions. *Preq:* MTHSC 208, PHYS 221.

341 Electromagnetics II 2(2,0) Introduction to magnetostatics and electrodynamics with application. Steady electric current, Ohm's law, Joule's law, Ampere's force law, magnetic forces and field, Biot-Savart's law, Boundary conditions, magnetic materials, inductance, magnetic circuits, Faraday's law, electromotive force, Maxwell's equations, electromagnetic waves. *Preq:* E C E 202, E C E 340.

360 Electric Power Engineering 3(3,0) Course presents the basic principles of electromagnetic induction and electromagnetic forces developed. Topics include synchronous machines, power transformers, electric power transmission and distribution systems, DC motors, and induction motors. *Preq:* E C E 262 and PHYS 221.

371 Microcomputer Interfacing 4(3,2) Interfacing of microcomputers to peripherals or other computers for purposes of data acquisition, device monitoring and control, and other communications. The interfacing problem is considered at all levels including computer architecture, logic, timing, loading, protocols, and software laboratory for building and simulating designs. *Preq:* E C E 262, 272. *Coreq:* E C E 320.

380 Electromagnetics 3(3,0) Introduction to electric fields and potentials, dielectrics, capacitance, resistance, magnetic field, forces, work and energy, inductance, time-varying fields, and Maxwell's equations. *Preq:* E C E 262, PHYS 221, MTHSC 206.

381 Fields, Waves, and Circuits 3(3,0) Foundation of circuit theory, transmission lines and circuits, plane-wave propagation, fiber optics, radiation and antennas, coupled circuits. *Preq:* E C E 380, MTHSC 208.

404, 604 Semiconductor Devices 3(3,0)F Consideration of the principles of operation, external characteristics, and applications of some of the more important semiconductor devices presently available. *Preq:* E C E 320. *Coreq:* MTHSC 311 or 434.

405 Design Projects in Electrical and Computer Engineering 1-3(0,2-6) Individually defined projects oriented toward providing experience in establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation. Development of student creativity through the solution of open-ended problems. Individual instruction in design methodology. Maximum of 3 credit hours. *Preq:* E C E 302 or 330 or 409, consent of project supervisor.

406, 606 Introduction to Microelectronics Processing 3(3,0)S Microelectronic processing, MOS and bipolar monolithic circuit fabrication, thick and thin film hybrid fabrication, applications to linear and digital circuits, fundamentals of device design. *Preq:* E C E 320. *Coreq:* MTHSC 311 or 434.

407, 607 VLSI Reliability 3(3,0)S Reliability concepts applied to VLSI components. Methods of reliability determination, prediction, and attribute assessment. Failure analysis techniques. Wearout related mechanisms. Role of defects and electrical overstress in reliability. Reliability growth through design and process control. *Preq:* E C E 320. *Coreq:* MTHSC 311 or 434.

409 Continuous and Discrete Systems Design 3(3,0) Introduction to linear control systems. Topics include applications of state variables, time and frequency response, stability, systems specification, system design of continuous discrete systems. *Preq:* E C E 330. *Coreq:* E C E 495.

410, 610 Modern Control Theory 3(3,0) Introduction to modern control theory. Topics include fundamentals of matrix algebra, state space analysis and design, nonlinear systems and optimal control. *Preq:* E C E 302 or 409.

412 Electrical Machines Laboratory 1(0,2) Selected experiments which will help the student become familiar with characteristics of transformers, DC and AC motors and generators. Measurement techniques and component modeling will be included. *Coreq:* MTHSC 434 or consent of instructor. *Preq* or *Coreq:* E C E 360 or 419.

416, 616 Electric Power Distribution System Engineering 3(3,0) Includes load characteristics, distribution transformers, design of transmission line and distribution substations, design of primary and secondary systems, capacitors in distribution systems, and power system harmonics. *Preq:* E C E 360.

417, 617 Software Design 3(3,0)S Indepth study of methodologies and techniques used throughout the software development cycle including analysis, design, implementation, and testing. Additional topics include software development tools and software project management techniques. *Preq:* E C E 329, MTHSC 419.

418, 618 Power System Analysis 3(3,0)F Study of power system planning and operational problems. Subjects covered are load flow, economic dispatch, fault studies, transient stability and control of problems. System modeling and computer solutions are emphasized through class projects. *Preq:* E C E 341, 360, 380.

419, 619 Electric Machinery 3(3,0)S Performance and characteristics of AC and DC machines during steady-state and transient conditions. Coverage includes DC, induction, synchronous motors and alternators. Modeling and computer simulation are included. *Preq:* E C E 341, 360 or 380.

422, 622 Operational Amplifier Circuits 3(2,2) Analysis and design of circuits, both analog and digital, using operational amplifiers. *Preq:* E C E 321. *Coreq:* MTHSC 311 or 434.

423, 623 Power System Protection 3(3,0)S Covers basic requirements of power system protection, relaying principles and the basic techniques of over current, distance, differential and carrier protection, computer coordination and introduction to digital protection are introduced. *Coreq:* E C E 418; MTHSC 434 or consent of instructor.

426, 626 Digital Computer Design 3(3,0) Design of high-speed ALU's, control and timing circuitry, memory systems and I/O circuitry; microprogrammed computer design using bit-slice microprocessors; current hardware topics related to computer design; hands-on design experience; and use of logic analyzer for system debugging. *Preq:* E C E 371 or 429.

427 Communications Systems 3(3,0) Study of modulation techniques used in modern communications systems design, including continuous wave modulation (AM, FM, PM), analog and digital pulse modulation (PAM, PPM, PWM, PCM), and the impact of noise interference on these systems. *Preq:* E C E 317, 330. *Coreq:* MTHSC 434.

428, 628 Modulation and Noise 3(3,0)F Course covering the modulation techniques used in modern communication systems. Topics covered are spectral translations, stochastic description of signals and noise, correlation functions, power spectra, amplitude modulation, frequency and phase modulation, pulse amplitude modulation, and im-

pact of noise on systems employing these types of modulation. *Preq:* E C E 330; E C E 317 or MTHSC 400; MTHSC 311 or 434 or consent of instructor.

429, 629 Organization of Computers 3(3,0) Course in computer organization and architecture. Topics include a review of logic circuits, bus structures, memory organization, interrupt structures, arithmetic units, input-output structures, state generation, central processor organization, control function implementation, and data communication. Registered Transfer Language (RTL) for description and design of digital systems. *Preq:* CP SC 230 or E C E 250 or 272 or consent of instructor.

430, 630 Digital Communications 3(3,0)S Course in modern digital communications theory. Topics covered are discrete time signals, discrete Fourier transforms, channel bandwidth, channel distortion, coding of analog information, data signal encoding, introduction to decision theory, matched filter, baseband systems, AM, FM, PM, phase-locked loops, secure communications and contemporary communications systems. *Preq:* E C E 317 or MTHSC 400, E C E 330, MTHSC 311 or 434, or consent of instructor.

431, 631 Digital Electronics 3(2,2) Electronic devices and circuits of importance to digital computer operation and to other areas of electrical engineering are considered. Active and passive waveshaping, waveform generation, memory elements, switching, and logic circuits are some of the topics. Experimentation with various types of circuits is provided by laboratory projects. *Preq:* E C E 321. *Coreq:* MTHSC 311 or 434.

432, 632 Instrumentation 3(3,0)F Theory and analysis of transducers and related circuits and instrumentation. Generalized configurations and performance characteristics of instruments will be considered. Transducer devices for measuring physical parameters such as motion, force, torque, pressure, flow, and temperature will be discussed. *Preq:* E C E 321. *Coreq:* MTHSC 311 or 434.

433, 633 Sensors and Microcomputer Control for Robots 3(1,4)F Study of current robotics technology with emphasis on robots suitable for industrial applications that require locomotion and sophisticated sensors. Class design project will be coordinated to produce a working modular robot. *Preq:* E C E 302 or 409, 371 or consent of instructor.

434, 634 Power Electronics 3(3,0) Study of electronic devices and systems which are designed to control or regulate large amounts of power. Included are SCR applications to inverters, motors controls, high-current switching systems, voltage stabilizers, and other power applications of electronics are also considered. *Preq:* E C E 321, 360. *Coreq:* MTHSC 434 or consent of instructor.

435, 635 Optoelectronics 3(3,0)F Understanding of the design aspects and physical phenomenon forming the basis for devices used in electro-optical systems is provided. Topics include LEDs, laser diodes, detectors, noise, electro-optic devices, acousto-optic devices and system aspects. *Preq:* E C E 320, 340, 341 or 380, 381. *Coreq:* MTHSC 311 or 434.

436, 636 Transmission Lines and Microwave Circuits 3(3,0)F Study of the theoretical and practical aspects of transmission lines and waveguides. Smith Chart applications and design impedance matching networks, scattering parameters, interconnection and design of multiports. *Preq:* E C E 341 or 381 or equivalent. *Coreq:* MTHSC 311 or 434.

438, 638 Computer Communications 3(3,0)F Digital data transmission techniques, modems and communications channels, communications software and protocols, multiprocessors and distributed processing. Concurrency and cooperation of dispersed processors. *Preq:* Senior standing in Electrical or Computer Engineering or Computer Science or consent of instructor.

439, 639 Fiber Optics 3(3,0)F The underlying principles of design for optical fibers in practical systems are covered. Optical fiber as a waveguide is examined using wave optics and ray optics. Design criteria for using mono- and multi-mode fibers are discussed. Other topics include fabrication, measurement. *Preq:* E C E 340, 341 or 380, 381, PHYS 222. *Coreq:* MTHSC 311, 434, or consent of instructor.

440, 640 Performance Analysis of Local Computer Networks 3(3,0)S Introduction to the design and performance analysis of local computer networks. Emphasis is placed on performance analysis of representative multiaccess procedures. Three common types of networks are considered in detail. *Preq:* E C E 317 or MTHSC 400; E C E 250 or 272,

or equivalent.

442, 642 Knowledge Engineering 3(3,0)F Introduction to the theoretical and practical aspects of knowledge engineering or applied artificial intelligence. Topics to include symbolic representation structures and manipulation, unification, production systems and structures, rule-based and expert systems, planning and AI system architectures. System design in PROLOG and LISP. Project required. *Preq:* E C E 201; MTHSC 419 or consent of instructor. *Coreq:* E C E 329 or 429.

446, 646 Antennas and Propagation 3(3,0)S Study of the theoretical and practical aspects of antenna design and utilization, input impedances, structural considerations and wave propagation. *Preq:* E C E 330, 341, 436 or 381; MTHSC 311 or 434.

450 Computer System Design Project 2(0,4) A project-oriented course which brings together computer engineering students into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for individual and creative thinking as well as team effort. *Preq:* E C E 321, 329, 330.

451 System Design Project 2(0,4) A project-oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for individual and creative thinking as well as team effort. *Preq:* E C E 302, 321, 330.

452, 652 Programming Systems 3(3,0)S A second course in programming languages and systems. Topics include assemblers, compilers and syntactical methods; string manipulation and list processing; concepts of executive programs and operating systems; introduction to time-sharing systems. *Preq:* E C E 329, MTHSC 419.

453, 653 Software Practicum 3(1,6) The student must design and implement a software system that satisfies both a requirements and specifications document. The resulting system will be tested for compliance. *Preq:* E C E 417.

456, 656 (M E) Design and Application of Industrial Robots 3(3,0) See M E 456.

459, 659 Integrated Circuit Design 3(2,2) Design concepts and factors influencing the choice of technology. Fundamental MOS device design. Silicon foundaries, custom and semicustom integrated circuits. Computer-aided design software/hardware trends and future developments. Hands-on use of CAD tools to design standard library cells. Systems design considerations, testing, and packaging. *Preq:* E C E 321. *Coreq:* MTHSC 311 or 434.

460 Computer-Aided Analysis and Design 3(3,0) Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. *Preq:* E C E 262, MTHSC 311, 434, or consent of instructor.

467, 667 Introduction to Digital Signal Processing 3(3,0)S Introduction to characteristics, design, and applications of discrete time systems. Design of digital filters. Introduction to the Fast Fourier Transform (FFT). LSI hardware for signal processing applications. *Preq:* E C E 330.

468, 668 Embedded Microprocessor 3(2,2)S Interfacing, architecture, and design issues which arise when the microprocessor is embedded in electromechanical and human systems. Applications and design projects include guidance systems, robotics, process control, artificial limbs, etc. *Preq:* E C E 302 or 330 or 409 and 371, MTHSC 311 or 434 or consent of instructor.

H491 Undergraduate Honors Research 1-6 Individual research projects to be conducted under the direct supervision and guidance of a faculty member. May be repeated for a maximum of 6 credits.

492, 692 Special Problems 1-3(0,2) Special assignment in electrical or computer engineering. Some typical assignments include computer programs, term papers, technical literature searches, hardware projects, and design project leadership. May be taken only once for credit.

493, 693 Selected Topics 1-3(1-3,0) Classroom study of current and new technical developments in electrical and computer engineering. Course may be repeated for a maxi-

mum of 6 credit hours, but only if different topics are covered. *Preq:* Consent of instructor.

495 Integrated System Design I 2(1,3) Engineering design of systems is considered in a project context. Design methodology is embedded in a continuous process of project definition, planning, execution, and evaluation. This process includes consideration of both technical and nontechnical factors which influence project viability and desirability. *Preq:* E C E 321, 330, 360, 371, 381 (3 of which must have been completed prior to enrollment, with the remaining taken as corequisites courses). *Coreq:* E C E 409 (In addition to any deficit courses in the prerequisites).

496 Integrated System Design II 2(0,6) Project-oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for individual and creative thinking as well as team effort. *Preq:* E C E 321, 330, 360, 371, 381, 409, 495.

701 Master of Engineering Design Project 1-6

801 Analysis of Linear Systems 3(3,0)

802 Electric Motor Control 3(3,0)

803 Linear Control Theory and Design 3(3,0)

804 Methods of Applied Optimization and Optimum Control 3(3,0)

805 Methods of State and Parameter Estimation of Stochastic Systems 3(3,0)

806 Identification in Control 3(3,0)

807 Computer Methods for Power Systems Analysis 3(3,0)

808 Self-Organizing Control 3(3,0)

809 Semiconductor Materials 3(3,0)

811 Integrated Circuit Design 3(2,2)

817 Power System Transients 3(3,0)

819 Detection and Estimation Theory 3(3,0)

820 Theory of Communications I 3(3,0)

821 Theory of Communications II 3(3,0)

822 Information Theory 3(3,0)

823 Integrated Circuit Technology 3(3,0)

825 Solid-State Electronics 3(3,0)

830 Electromagnetics 3(3,0)

831 Advanced Electromagnetic Theory 3(3,0)

832 Electromagnetic Measurements 3(3,0)

834 Asymtopic Methods and Diffraction Theory 3(3,0)

836 Microwave Circuits 3(3,0)

837 Advanced Antenna Theory 3(3,0)

838 Special Topics in Electromagnetics 1(1,0)

839 Integral Equations in Electromagnetics 3(3,0)

840 Physics of Semiconductor Devices 3(3,0)

841 Distributed Computing and Networks 3(3,0)

842 Computer Architecture 3(3,0)

843 Computer Graphics 3(3,0)

844 Digital Signal Processing 3(3,0)

845 Computer System Design and Operation 3(3,0)

846 Digital Processing of Speech Signals 3(3,0)

847 Digital Image Processing 3(3,0)
848 Telecommunication Network Modeling and Analysis 3(3,0)
849 Advanced Topics in Computer Communications 3(3,0)
850 Computation and Simulation 3(3,0)
851 Advanced Topics in Computer Architecture 3(3,0)
852 Software Engineering 3(3,0)
853 Computer Data Displays 3(3,0)
854 (M E) Analysis of Robotic Systems 3(3,0)
855 Artificial Intelligence 3(3,0)
856 Pattern Recognition 3(3,0)
857 Coding Theory 3(3,0)
858 Automata Theory 3(3,0)
859 (M E) Intelligent Robotic Systems 3(3,0)
861 Computer Relaying of Power Systems 3(3,0)
862 Real Time Computer Application in Power Systems 3(3,0)
863 Power System Dynamics and Stability 3(3,0)
870 Biosystems Analysis 3(3,0)
890 Engineering Report Research. Credit to be arranged.
891 Master's Research. Credit to be arranged.
892 Special Problems in Electrical and Computer Engineering 1-3(1-3,0)
893 Selected Topics in Electrical and Computer Engineering 1-3(1-3,0)
991 Doctoral Research. Credit to be arranged.

ENGINEERING (ENGR)

Professor: W. F. Beckwith, *Director; Associate Professor:* J. L. Josey, H. J. Park

101 Introduction to Engineering 1(0,2) Introduction to engineering. Skills with dimensions, units, calculators, and technical communications are developed, and engineering ethics is emphasized. Career guidance is provided, including surveys of the professional fields of engineering, the engineering curricula, and engineering departments.

110 Engineering Problems Workshop 1(0,2) Workshop devoted to the analysis and solution of engineering-oriented problems. Representative problems taken from the different fields of engineering will be used to illustrate such analytical and problem-solving techniques as estimation and approximation, numerical aids to computation, and solutions by graphical methods.

150 Introduction to Materials 1(1,0) Introduction to materials used in modern technology. Different materials (metals, ceramics, and polymers) and different forms (bulk, fibers, gels, thin films, etc.) will be discussed in the context of their application to consumer products, structural composites, refractories, biomedical implants, and electronic and optical materials. *Preq:* Enrollment in Freshman Engineering or consent of instructor.

180 Computers in Engineering 3(2,3) Introduction to the use of computers in engineering analysis, design, and communications. A high-level programming language and other software are used on micro computers. *Preq:* Engineering major; knowledge of a computer language. *Coreq:* MTHSC 106.

220 Technology in the Modern World 3(3,0) Designed for technical and nontechnical students to give an appreciation of the two-way interaction between technology and society. Historical, present, and projected topics will be included from a variety of disciplines. *Preq:* Sophomore standing in any college.

ENGINEERING GRAPHICS (E G)

Associate Professors: V. B. Anand, N. M. Aziz, D. L. Ryan; *Assistant Professor:* L. C. Cleveland; *Lecturer:* C. A. Balch

108 Microcomputer Graphics 1(0,2) Designed for the introduction of PC-based CADD interactive systems as a means of communication. Areas of study include laboratory experience with PC hardware, CADD packages, data entry, shell commands, entity manipulation, and display generation.

109 Engineering Graphics 2(1,3)[1] A course for the introduction of engineering graphics as a problem-solving tool. Areas of study include theory of orthographic points, lines, planes, and solids; sectional views; dimensioning; and design drawings.

208 Engineering Graphics with Computer Applications 3(2,3)[1] Course designed for the introduction of basic concepts in engineering graphics as a means of communication. Areas of study include theory of orthographic projections, descriptive modeling, and computer graphics. *Preq:* ENGR 180.

209 Introduction to Engineering/Computer Graphics 2(1,3)[1] Designed for the introduction of basic graphical concepts needed for engineering application, including orthographic projections, descriptive modeling, and computer graphics. *Preq:* ENGR 180.

308 Computer-Aided Engineering Graphics 3(2,2) Continuation of E G 208 with emphasis on computer programming for graphics displays. *Preq:* E G 208 or consent of instructor.

411 Computer-Aided Process Planning—Graphics 3(3,0) This course introduces the student to the computer-aided processes used in the A&E office. It is designed to be compatible with current industrial practices, equipment, and procedures to produce construction drawings. *Preq:* Senior standing or consent of department head.

412, 612 Interactive Computer Graphics 3(3,0) Graphics hardware and display technology. Reduction and presentation of engineering data. Techniques of geometrical transformations, perspective and model manipulation. Methodology of computer-aided design. Application of higher-level software to engineering problems. *Preq:* E G 208 and MTHSC 208 or consent of instructor.

490, 690 Special Topics in Engineering and Computer Graphics 1-3(1-3,0) Comprehensive study of any computer-aided topic in engineering graphics not covered in other courses. May be repeated for a maximum of 6 credits. *Preq:* Consent of instructor.

823 Computer-Aided Geometric Modeling 3(3,0)

ENGINEERING MECHANICS (E M)

Professors: S. C. Anand, R. H. Brown, W. E. Castro, J. G. Goree, E. H. Law, R. F. Nowack, B. L. Sill, P. R. Sparks; *Associate Professors:* S. B. Biggers, J. M. Kennedy, N. F. Knight, Jr.; *Assistant Professors:* P. F. Joseph, T. A. Reinhold, S. D. Schiff, J. M. Snyder

201, H201 Engineering Mechanics: Statics 3(3,0) Forces and force systems and their external effect on bodies, principally the condition of equilibrium. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Preq:* PHYS 122. *Coreq:* MTHSC 206.

202, H202 Engineering Mechanics: Dynamics 3(3,0) Continuation of E M 201. The principal topics are kinematics and kinetics of particles and rigid bodies of finite size. Techniques of vector mathematics are employed. *Preq:* E M 201, MTHSC 206.

304, H304 Mechanics of Materials 3(3,0) The relationships between external loads on solid bodies or members and the resulting internal effects and dimension changes, including the derivation of rational formulas for stresses and deformations and the identification and use of important mechanical properties of engineering materials. *Preq:* E M 201, MTHSC 206.

305 Mechanics of Materials Laboratory 1(0,3) Theoretical relationships considered in E M 304 are verified. Students observe the behavior under load and the failure of engineering materials; identify and evaluate mechanical properties of materials important

[1]Credit toward a degree will be given for only one of the following: E G 109, 208, 209.

to design and manufacturing processes; and are acquainted with various testing methods, testing machines, and instruments. *Preq:* Must be accompanied or preceded by E M 304; E M 202.

320, H320 Fluid Mechanics 3(3,0) The behavior of fluids at rest or in motion, including the study of fluid properties. Emphasis is placed upon a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. *Preq:* E M 202.

322 Fluid Mechanics Laboratory 1(0,3) The principles developed in E M 320 are verified and demonstrated. Familiarization with orderly techniques in organizing and reporting results of experimental investigations and with the use of instruments and equipment is afforded. *Preq:* Must be accompanied or preceded by E M 320.

425, 625 Advanced Strength of Materials 3(3,0) Topics in strength of materials not covered in E M 304. Three-dimensional stress and strain transformations, theories of failure, shear center, unsymmetrical bending, curved beams, and energy methods. Other topics such as stress concentrations and fatigue concepts are treated as time permits. *Preq:* E M 304.

430, 630 Mechanics of Composite Materials 3(3,0) Fundamental relationships for predicting the mechanical and thermal response of multi-layered materials and structures are developed. Micromechanical and macromechanical relationships are developed for laminated materials with emphasis on continuous filament composites. The unique nature of composites and the advantages of designing with composites are discussed. *Preq:* E M 304.

450, 650 Mechanical Vibrations 3(3,0) Mathematical analysis of physical problems in the vibration of mechanical systems. Topics include linear-free vibrations, forced vibrations, and damping in single degree of freedom systems, transient vibrations, critical speeds and whirling of rotating shafts, dynamic balancing, and multidegree of freedom systems with lumped parameters. *Preq:* E M 202, 304, MTHSC 208.

470, 670 Experimental Stress Analysis 3(2,3) Experimental analysis of static and dynamic stress fields. Emphasis is on the techniques required to obtain data and the theoretical analysis required for proper interpretation. Methods and instrumentation associated with strain gages (including transducer applications), Moire grids, brittle coatings, photoelasticity, and photoelastic coatings are studied. *Preq:* E M 304 and consent of instructor.

829 Energy Methods and Variational Principles 3(3,0)

831 Theory of Elasticity I 3(3,0)

832 Theory of Elasticity II 3(3,0)

834 Principles of Structural Stability 3(3,0)

836 Fracture Mechanics 3(3,0)

845 Intermediate Dynamics 3(3,0)

852 (C E) Finite Element Analysis in Solid Mechanics 3(3,0)

860 Mechanics of Plasticity 3(3,0)

891 Master's Research. Credit to be arranged.

893 Selected Topics in Engineering Mechanics 1-6(1-6,0)

901 Foundations of Nonlinear Shell Theory 3(3,0)

991 Doctoral Research. Credit to be arranged.

ENGLISH (ENGL)

Professors: J. R. Andreas, *Head*; H. B. Bryant, R. J. Calhoun, F. L. Day, S. K. Eisiminger, D. G. Goswami, J. L. Idol, G. W. Koon, R. W. Moran, R. B. Rollin, F. W. Shilstone, M. S. Steadman, R. A. Underwood, M. R. Winchell, C. H. Woodell, A. P. Young; *Associate Professors:* R. E. Barfield, D. G. Bzdyl, M. J. Charney, M. J. Jacobi, C. E. Johnston, C. R. Lovitt, T. W. Russell, D. C. Tillinghast, C. M. Ward, E. P. Willey, D. H. Winchell; *Assistant Professors:* A. Bennett, S. D. Boerckel, W. K. Chapman, B. Daniell, K. J. Dettmar, S. J. Hilligoss, T. W. Howard, A. L. Low, L. W. Rollin, E. K. Sparks, E. V.

Truesdale, D. R. White; *Instructors:* C. A. Benson, J. D. Boyles, L. M. Christoph, B. K. Dickel, W. E. Edminster, R. L. Ellis, M. L. Ennes-Marvin, T. R. Flinchum, S. L. Jones, M. B. Knight, J. M. Kuehnel, A. J. Malik, E. J. Marshall, J. L. Marvin, L. Roy, D. L. West-Maciaszek; *Lecturers:* B. J. Ramirez, S. S. Titus, M. L. Walker; *Visiting Assistant Professor:* L. C. McCall; *Visiting Instructors:* M. C. Barton, M. E. Beardsley, S. J. Fallon, M. L. Farmer, A. M. Hallin, L. L. Higgs, C. L. Holt, S. M. Lomas, M. T. Reilly, E. C. Rice, D. M. Robertson, S. R. Shealy, E. R. Spruell

100 English Fundamentals 3(3,0) Drill in basic writing skills: mechanics, spelling, syntax, usage, dialect, sentence clusters, and paragraphing. Required of all freshmen who do not make a satisfactory score on the SAT verbal. Carries no credit for graduation.

101, H101 Composition I 3(3,0) Training in correct and effective expression in brief expository essays; review of the fundamentals of grammar and punctuation; instruction in common expository methods.

102, H102 Composition II 3(3,0) Continued emphasis on correct and effective expression; training in the organization and writing of the research report. *Preq:* ENGL 101.

111 English as a Second Language 3(3,2) Special course for students learning English as a second language. Intensive study and drill in American English pronunciation and listening comprehension. Required of all foreign students who do not make a satisfactory grade on screening examination in oral English. To be taken Pass/Fail only. Carries no credit for graduation.

190 The Study of English 1(1,0) Orientation to the study of English language and literature and to the sources and methods of literary research. Required of all English majors and recommended for minors.

202, H202 The Major Forms of Literature 3(3,0) Study of the basic structures and elements of fiction, poetry, and drama, including literary and critical theory, with readings in American, British, and world literature. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

203, H203 Survey of English Literature I 3(3,0) Chief British authors and works from Beowulf to the Romantic period. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

204, H204 Survey of English Literature II 3(3,0) Chief British authors and works from the Romantic period to 1945. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

205, H205 Survey of American Literature I 3(3,0) American literature to the Civil War, with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

206, H206 Survey of American Literature II 3(3,0) American literature from the Civil War to 1945, with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

207, H207 Survey of World Literature I 3(3,0) Translations of continental European literature from Homer to the Renaissance (together with some Asian classics), with emphasis on major authors. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

208, H208 Survey of World Literature II 3(3,0) Translations of continental European literature from the 17th century to the present (together with some Asian classics), with emphasis on major writers. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

209, H209 Contemporary Literature 3(3,0) Study of selected writers since 1945, primarily British and American. Proficiency in composition must be demonstrated. *Preq:* ENGL 102.

H210 Writing about Literature 3(3,0) A literature and composition course for honors students who have exempted ENGL 101 and 102. Readings in American, English, and world literature and advanced training in writing and research. *Preq:* Exemption from ENGL 101 and 102 or consent of the instructor.

217 Vocabulary Building 3(3,0) Development of a useful discriminating vocabulary for

writing, speaking, and reading. Student notebooks and proficiency quizzes. *Preq:* ENGL 102.

231 Introduction to Journalism 3(3,0) Instruction and practice in writing for mass media; editorial responsibilities. *Preq:* ENGL 102.

300 Introduction to Linguistics 3(3,0) Introduction to general linguistic principles. A survey of the biological, structural, and social aspects of language. *Preq:* Sophomore literature.

304 Business Writing 3(3,0) An introduction to business writing: memoranda, letters, reports, and research methods. *Preq:* Junior standing.

312 Advanced Expository Writing 3(3,0) A workshop in practical writing focusing on principles and style. *Preq:* Sophomore literature or consent of instructor.

314 Technical Writing 3(3,0) Intensive training in the fundamentals of technical writing: reports, letters, and memoranda. *Preq:* Junior standing.

316 Writing and International Trade 3(3,0) Students will complete projects demanding a variety of communications skills that professionals in International Trade need; sensitivity to foreign audiences and cultures in oral and written communication, electronic and graphic communication, collaborative writing and management. *Preq:* Sophomore literature.

331 Publications Workshop 1(1,0) Workshop designed for students who serve on student publication staffs. This course emphasizes the responsibilities of staff members. May be repeated for a maximum of 3 credits. *Preq:* ENGL 102 and consent of the instructor.

333 Reporting for the News Media 3(3,0) Practical experience in gathering and writing news and feature copy for the media, concentration on print journalism; examination of the role of the modern journalist; laws governing the profession; journalistic ethics. *Preq:* ENGL 231 or consent of instructor.

334 Feature Writing 3(3,0) Practical experience in writing feature articles for newspapers, magazines, and free-lance markets. *Preq:* ENGL 231 or consent of instructor.

335 Editing for Newspapers 3(3,0) Examination of the editing process of newspapers and magazines. Practical experience in article selection, copy-editing, headline writing, and page design. *Preq:* ENGL 231 or consent of instructor.

345 The Structure of Fiction 3(3,0) Introduction to the creative writing and critical study of prose fiction. *Preq:* Sophomore literature or consent of instructor.

346 The Structure of Poetry 3(3,0) An introduction to the creative writing and critical study of poetry. *Preq:* Sophomore literature or consent of instructor.

347 (THEA) The Structure of Drama 3(3,0) See THEA 347.

350 Mythology 3(3,0) A study of the great myths of the world with an emphasis on their applications to literature. *Preq:* Sophomore literature or consent of instructor.

351 American Folklore 3(3,0) Study of American folklore with an emphasis on such considerations as the folktale, folk songs and ballads, folk heroes, and folk superstitions and remedies. *Preq:* Sophomore literature or consent of instructor.

353 Ethnic American Literature 3(3,0) A critical examination of essays, poetry, fiction, and drama written by members of a variety of American racial and ethnic groups, such as Native Americans, Afro-Americans, Chicano-Mexicans, Asian Americans, Italian Americans, and American Jews. *Preq:* Sophomore literature or consent of instructor.

355 Popular Culture 3(3,0) An examination of the nature, functions, history, and impact upon American society of best sellers, popular magazines, television, movies, and other like phenomena. *Preq:* Sophomore literature or consent of instructor.

356 Science Fiction 3(3,0) Readings in science fiction from the 17th century to the present, with special emphasis on writers since Verne and Wells. *Preq:* Sophomore literature or consent of instructor.

357 Film 3(2,3) Examination of the film medium as an art form: its history, how films are made, why certain types of films (western, horror movies, and so forth) have be-

come popular, and how critical theories provide standards for judging film. *Preq:* Sophomore standing or consent of instructor.

358 Advanced Studies in Film 3(2,3) Continued study of film theory and aesthetics, with applications of that knowledge to the making of a film or video. *Preq:* ENGL 357 or consent of instructor.

359 Special Topics in Language, Literature, or Culture 3(3,0) Studies in varied topics not central to other English courses, such as Literature and Art/Business/Sports; Language and Style; Black Literature. Specific titles and course descriptions to be announced from semester to semester. May be repeated once with department head's consent. *Preq:* Sophomore literature or consent of instructor.

H367 Special Topics for Honors Students 3(3,0) Varied topics of general interest in literature, language, rhetoric, or culture for all honors students. Specific topics announced from semester to semester. May be repeated for a maximum of 9 credits. *Preq:* Sophomore literature.

380 British and American Women Writers 3(3,0) Poetry, drama, fiction, and prose by established and little-known women writers in Britain and America. Particular attention to works treating themes and issues concerning women's lives. Readings on such topics as women and work, education, religion, creativity. *Preq:* Sophomore literature or consent of instructor.

385 Children's Literature 3(3,0) Wide reading in prose and verse suitable for children in elementary grades. *Preq:* Sophomore literature.

386 Adolescent Literature 3(3,0) Wide reading in prose and verse suitable for children in secondary schools. *Preq:* Sophomore literature.

400, 600 The English Language 3(3,0) Studies in English usage and the historical development of the language. *Preq:* Sophomore literature.

401, 601 Grammar Survey 3(3,0) Survey of modern grammars with a focus on exploring the impact structural grammar has had on traditional grammar. Recommended for English teachers. *Preq:* Sophomore literature.

402, 602 Syntax 3(3,0) Introduction to transformational grammar with a focus on syntax. *Preq:* ENGL 300 or consent of instructor.

403, 603 The Classics in Translation 3(3,0) An examination of Homer's *Iliad and Odyssey,* Virgil's *Aeneid,* and Ovid's *Metamorphoses.* A few shorter works by other Greek and Roman writers may also be read. *Preq:* Sophomore literature.

404, 604 Classical Drama 3(3,0) Selected reading in the dramatic literature of classical Greece and Rome. *Preq:* Sophomore literature.

405, 605 Studies in English Literature to 1700 3(3,0) Selected reading in English literature from the beginnings to 1700, with emphasis on social and intellectual backgrounds. *Preq:* Sophomore literature.

406, 606 Studies in English Literature Since 1700 3(3,0) Selected readings in English literature from 1700 to the present, with emphasis on social and intellectual backgrounds. *Preq:* Sophomore literature.

407, 607 The Medieval Period 3(3,0) Selected works of Old and Middle English literature, exclusive of Chaucer. *Preq:* Sophomore literature.

408, 608 Chaucer 3(3,0) Selected readings in Middle English from *The Canterbury Tales* and other works by Chaucer. *Preq:* Sophomore literature.

409, 609 The Earlier English Renaissance 3(3,0) Tudor and Elizabethan poetry, prose, fiction, translations, essays, and criticism. *Preq:* Sophomore literature.

410, 610 Drama of English Renaissance 3(3,0) Selected readings in non-Shakespearean dramatic literature of the16th and 17th centuries. *Preq:* Sophomore literature.

411, 611 Shakespeare 3(3,0) A study of selected tragedies, comedies, and history plays of Shakespeare. Required of all English majors. *Preq:* Sophomore literature.

412, 612 Studies in Shakespeare 3(3,0) Special topics in Shakespeare as selected by instructors. May be repeated once with department head's consent. *Preq:* Sophomore literature.

413, 613 Later English Renaissance 3(3,0) Nondramatic poetry and prose from Ben Jonson, John Donne, and Francis Bacon through Andrew Marvell and John Bunyan, excluding Shakespeare and Milton. *Preq:* Sophomore literature.

414, 614 Milton 3(3,0) The development of Milton's art and thought from the minor poems and selected prose through *Paradise Lost, Paradise Regained, and Samson Agonistes,* set against the background of the late Renaissance. *Preq:* Sophomore literature.

415, 615 The Restoration and Eighteenth Century 3(3,0) Readings in Dryden, Swift, Pope, and Dr. Johnson. *Preq:* Sophomore literature.

416, 616 The Romantic Period 3(3,0) Readings from the poetry and critical prose of Blake, Wordsworth, Coleridge, Byron, Shelley, Keats, and other representative figures. *Preq:* Sophomore literature.

417, 617 The Victorian Period 3(3,0) Reading from the poetry and nonfiction prose of selected Victorian authors, including works of Carlyle, Tennyson, Browning, Arnold, and other representative figures. *Preq:* Sophomore literature.

418, 618 The English Novel 3(3,0) Study of the English novel from its 18th century beginnings through the Victorian Period. *Preq:* Sophomore literature.

422, 622 American Literature I 3(3,0) Major American authors and movements from the Colonial period to the Civil War. *Preq:* Sophomore literature.

423, 623 American Literature II 3(3,0) Major American authors and movements from the Civil War to the early 20th century. *Preq:* Sophomore literature.

424, 624 American Literature III 3(3,0) Major American authors and movements of the 20th century. *Preq:* Sophomore literature.

425, 625 The American Novel 3(3,0) A survey of the most significant forms and themes of the American novel from its beginnings to 1900. *Preq:* Sophomore literature.

426, 626 Southern Literature 3(3,0) The intellectual and literary achievement of the South from1607 to the present, with emphasis upon the writers of the 19th century. *Preq:* Sophomore literature.

430, 630 Modern Drama 3(3,0) Principles and progress of drama from Ibsen to the present; analysis of representative plays; critical reports; discussion of trends in contemporary drama. *Preq:* Sophomore literature.

431, 631 Modern Poetry 3(3,0) The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. *Preq:* Sophomore literature.

432, 632 Modern Fiction 3(3,0) American and British novels and short stories of the 20th century. *Preq:* Sophomore literature.

433, 633 The Anglo-Irish Literary Tradition 3(3,0) Exploration of the unique literary heritage and achievement of English-language Irish writers in the 19th and 20th centuries. Major figures of the Irish tradition: W. B. Yeats, James Joyce, and Samuel Beckett, and other writers; consideration of the specifically Irish aspects of their works. *Preq:* Sophomore literature.

435, 635 Literary Criticism 3(3,0) Major critical approaches to literature. *Preq:* Sophomore literature.

436, 636 Feminist Literary Criticism 3(3,0) Introduction to the germinal works of feminist literary theory and criticism. Outlines the development of modern literary criticism by studying feminist versions of the major critical methodologies. *Preq:* Sophomore literature or consent of instructor.

437, 637 Directed Studies 1-3(1-3,0) Class and tutorial work for students with special interests or projects in American, British, or European literature outside the scope of existing courses. Application(s) must be approved during the preregistration period of the semester preceding the one in which directed studies will occur. May be repeated by arrangement with the department. *Preq:* Junior standing and approved preregistration.

H438 Departmental Honors Research 3(3,0) Research for the preparation of an honors project. *Preq:* Second semester Junior standing and the approval of the English

Honors Committee.

H439 Departmental Honors Project 3(3,0) Preparation of an honors project. *Preq:* ENGL H438 and first-semester Senior standing.

445, 645 Fiction Workshop 3(3,0) A workshop in the creative writing of prose fiction. May be repeated one time for credit. *Preq:* ENGL 345 or consent of instructor.

446, 646 Poetry Workshop 3(3,0) A workshop in the creative writing of poetry. May be repeated one time for credit. *Preq:* ENGL 346 or consent of instructor.

447, 647 (THEA) Playwriting Workshop 3(0,3) See THEA 447.

450, 650 Film Genres 3(2,3) Advanced study of films that have similar subjects, themes, and techniques, including such genres as the Western, horror, gangster, science fiction, musical, and/or screwball comedy. Course will also consider nontraditional genres, screen irony, genre theory, and historical evolution of genres. Topics vary. *Preq:* ENGL 357 or consent of instructor.

451, 651 Film Theory and Criticism 3(2,3) Advanced study into the theory of film/video making with an emphasis on understanding a variety of critical methods to approach a film. Course examines the history of film theory and defines the many schools of film criticism, including realism, formalism, feminism, semiotics, Marxism, and expressionism. *Preq:* ENGL 357 or consent of instructor.

452, 652 Great Directors 3(2,3) Intensive study of one to three film directors with an emphasis on understanding the entire canon of each director. Students will study similarities in techniques, shifts in thematic emphasis, and critical methodologies for approaching the works of each director. Topics vary. *Preq:* ENGL 357 or consent of instructor.

453, 653 Sexuality and the Cinema 3(2,3) Examination of male/female sexual roles and their evolution in American genre films, avant-garde cinema, and international films. Course will include the study of movies in relation to cultural values and social stereotypes, introduction to feminist film theory, and consideration of issue of film pornography. *Preq:* ENGL 357 or consent of instructor.

455, 655 American Humor 3(3,0) Native American humor of the 19th and 20th centuries. *Preq:* Sophomore literature.

459 Advanced Special Topics in Language, Literature, or Culture 3(3,0) Advanced studies in topics not central to other English courses, such as certain authors, works, genres, themes, or areas of knowledge and culture. Specific topics will be announced when offered. May be repeated once for credit with department head's consent. *Preq:* Sophomore literature.

485, 685 Composition for Teachers 3(3,0) Practical training in teaching composition: finding workable topics, organizing and developing observations and ideas, evaluating themes, and creative writing. *Preq:* Sophomore literature.

490, 690 Advanced Technical and Business Writing 3(3,0) Advanced work in writing proposals, manuals, reports, and publishable articles. Students will produce work individually and in groups. *Preq:* ENGL 304 or 314 or consent of instructor.

491, 691 (SPCH) Classical Rhetoric 3(3,0) Study of the major texts in classical rhetoric. This course examines the nature and functions of rhetoric in Greek and Roman societies. It traces the development of rhetoric from Protagoras through Isocrates, Plato, Aristotle, Cicero, and Quintillian, and considers questions essential to understanding persuasive theory and practices. *Preq:* Sophomore literature or consent of instructor.

492, 692 (SPCH) Modern Rhetoric 3(3,0) Examines the "new rhetorics" of the 20th century, which are grounded in classical rhetoric but which include findings from biology, psychology, linguistics, and anthropology, among other disciplines. It considers the theories and applications of communication. *Preq:* Sophomore literature or consent of instructor.

495, 695 Technical Editing 3(3,0) Practical experience in editing and preparing technical manuscripts for publication. General introduction to the functions of the technical editor. *Preq:* ENGL 304, 314, or consent of instructor.

700 Children's Literature for Teachers 3(3,0)

701 Literature for Teachers 3(3,0)

702 Writing Projects 3(3,0)

800 Introduction to Research 1(1,0)

801 Topics in Composition 3(3,0)

802 Topics in Literary Genres 3(3,0)

803 Topics in Rhetorical Theory 3(3,0)

805 Topics in Medieval Literature 3(3,0)

808 Topics in Renaissance and Restoration Literature 3(3,0)

811 Topics in Neoclassical and Romantic Literature 3(3,0)

814 Topics in Victorian and Modern British Literature 3(3,0)

820 Topics in American Literature to 1865 3(3,0)

823 Topics in American Literature Since 1865 3(3,0)

831 Special Topics 3(3,0)

832 Topics in Scientific, Technical, and Business Writing 3(3,0)

835 Topics in Literary Criticism 3(3,0)

837 Topics in Linguistics 3(3,0)

840 Directed Studies 3(3,0)

850 Research and Studies in Scientific, Business, and Technical Writing 3(3,0)

851 Seminar in Professional Writing 3(3,0)

853 Visual Communications 3(3,0)

854 Teaching Professional Writing 3(3,0)

855 Linguistics for Professional Communication 3(3,0)

885 Composition Theory 3(3,0)

891 Master's Research. Credit to be arranged.

892 Master's Project 1-3

ENTOMOLOGY (ENT)

Professors: D. R. Alverson, T. M. Brown, G. R. Carner, C. S. Gorsuch, R. P. Griffin, J. C. Morse, R. Noblet, T. E. Skelton, *Head; Associate Professors:* P. H. Adler, J. D. Culin, P. A. Zungoli; *Assistant Professor:* H. W. Fescemyer; *Instructor:* C. B. Moore;*Visiting Professor:* S. B. Hays; *Visiting Assistant Professor:* W. E. Barton

200 Insects 2(2,0) Introduction to insects; their various relationships with man, other animals and plants. The general nature of this course makes it beneficial to all students regardless of specialty. Closed to students who have had ENT 301 or equivalent.

201 Current Topics in Entomology 1(1,0) Discussion course covering topics dealing with insects and related arthropods. Subjects will be chosen to reflect issues of current interest as well as those having significance in human history.

300 Environmental Entomology 3(3,0)S Exploration of the diversity and roles of insects in natural and affected environments, the impact of insects and pesticides on environmental quality, and discussion of environmental ethics in entomological science. *Preq:* Any biological or physical science.

301 General Entomology 4(3,3) Introduction to the study of insects, with emphasis on their structure, function, ecology, and behavior. Identification of commonly encountered species is highlighted. Relationships between insect and human populations are discussed. Control technologies are introduced, with emphasis on environmentally responsible tactics.

308 Apiculture 3(2,3)S Even-numbered years. A detailed study of the honey bee and its economic importance in pollination and honey production. Attention will be given to bee behavior, colony management, equipment, honey-plant identification, and honey production and processing. *Preq:* BIOL 104 and consent of instructor.

355 Veterinary Entomology 3(2,3) Study of the biology, identification, damage and management of arthropod pests of veterinary importance and their role in transmission of diseases in animals, principally domestic livestock and poultry. Students will learn both the theoretical and practical aspects of integrated management of arthropod pests of livestock and poultry. *Preq:* Junior standing.

401, H401, 601 Insect Pests of Ornamental Plants and Shade Trees 3(2,3)F Odd-numbered years. Recognition, biology, damage and control of insect pests of woody and other ornamental plants and shade trees. *Preq:* ENT 301.

402, H402, 602 Fruit, Nut, and Vegetable Insects 3(2,3)F Odd-numbered years. Common insect pests of the following are studied: peaches, apples, grapes, brambles, blueberries, strawberries, pecans, sweet corn, cole crops, cucurbits, potatoes, sweet potatoes, peas, peppers, tomatoes, and beans. Primary emphasis is placed on life histories, identification of destructive forms, recognition of damage, and current control measures. *Preq:* ENT 301.

403, H403, 603 Field Crop Entomology 3(2,3)F Even-numbered years. Recognition, life histories, damage and control of economically important insect pests of major field crops, with an introduction to principles and practices of crop protection, including pesticide application, economic basis for making treatment decisions, and development of scouting programs. *Preq:* ENT 301.

404, H404, 604 Urban Entomology 3(2,3)S Even-numbered years. Study of pests common to the urban environment with emphasis on biology, damage, control, and identification of household, structural, stored products, and food pests. Students will learn both theoretical and practical aspects of urban pest management and the pest-control industry. *Preq:* ENT 301.

405, H405, 605 Insect Morphology 4(3,3)F Even-numbered years. A study of insect structure in relation to function and of the variation of form in insects. *Preq:* ENT 301.

406, H406, 606 (PL PA) Diseases of Ornamental Plants 3(2,2) See PL PA 406.

410, 610 Insect Taxonomy 3(1,6)S Odd-numbered years. The identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification; lecture material deals with theoretical discussion of taxonomic features observed in the laboratory. *Preq:* ENT 405 or consent of instructor.

412, 612 Field and Museum Entomology 3(0,9)SS Practical aspects of gathering, sorting, and curating insects. Students participate in intensive overnight insect-collecting expeditions to various parts of the Southeastern United States, becoming acquainted with insect habitats and collecting methods. The remainder of the summer session will be devoted to training in specimen preparation and preservation. *Preq:* Consent of instructor.

420, 620 Toxicology of Insecticides 3(2,3)S Odd-numbered years. Concepts of insecticide toxicology; principles of insecticide action; toxicological and pharmacological effects in insects and higher animals, safety, current regulations governing the use of insecticides. *Preq:* ENT 301.

430, 630 (ENTOX) Toxicology 3(3,0) Basic principles of toxicology including quantitation of toxicity, toxicokinetics, biochemical action of poisons, and environmental toxicology are studied. Acute and chronic effects of various classes of poisons (e.g., pesticides, drugs, metals, and industrial pollutants) are discussed in relation to typical routes of exposure and regulatory testing methods. *Preq:* Organic Chemistry, one year of general biology, or consent of instructor.

440, 640 Insect Behavior 3(2,3)F Odd-numbered years. Fundamentals of insect behavior in an evolutionary and ecological perspective. Laboratories emphasize generation and testing of hypotheses and observation, description, and quantification of insect behavior. *Preq:* ENT 301 or consent of instructor.

455, H455, 655 Medical and Veterinary Entomology 3(2,3)S Even-numbered years. Insects and their arthropod relatives which are of economic importance in their effect on man and animals. *Preq:* ENT 301 or consent of instructor.

461 Directed Research in Entomology 1-3(0,3-9) Development of a senior thesis based on a research problem in a selected entomological area. Emphasis will be placed on integrating the knowledge gained in the student's program with the results of the re-

search project. May be repeated for a maximum of 3 credits. *Preq:* Senior standing and consent of instructor.

462, 662 Seminar 1(1,0) Literary search and oral presentation of current entomological topics. More than one presentation may be required. Course may be repeated for credit.

468, 668 Management Skills for Scientists 2(2,0)F An introduction to skills outside the knowledge of scientific principles that are necessary to develop and coordinate activities in a research laboratory. Topics include developing grant proposals, locating information on extramural funding, coordinating personnel, managing data and literature, and complying with government regulations on personnel, animal experimentation and biohazards. *Preq:* Junior standing or consent of instructor.

469, H469, 669 (W F B) Aquatic Insects 3(1,6)S Odd-numbered years. Identification, life history, habitats, and interrelationships of aquatic insects; techniques of qualitative field collecting; important literature and research workers. *Preq:* ENT 301 or consent of instructor.

470, H470, 670 Insect Physiology 3(2,3)S Odd-numbered years. Introduction to the physiological systems of insects, including structure as related to function. Emphasis will be on digestion, nutrition, reproduction, respiration, excretion, and nervous and hormonal systems as they affect growth and development in insects. *Preq:* ENT 301 or consent of instructor.

480, H480, 680 Insect Pathology 3(2,3)S Even-numbered years. Study of insect diseases including those caused by viruses, rickettsiae, bacteria, fungi, protozoa, and nematodes will be covered in this course. The effects of diseases on insect populations and the use of pathogens in insect control will also be considered in detail. *Preq:* ENT 301 or consent of instructor.

490 Practicum 1-4 Supervised entomological learning opportunity providing highly individualized experiences to complement other programs and courses. Must be prearranged at least two months in advance. Must file written report midway during enrollment period and at its conclusion. Must appear for oral evaluation at the end of the period. *Preq:* Junior standing and consent of instructor.

700 Entomology for Teachers 3(2,2)

808 Taxonomy of Immature Insects 3(1,6)

809 Seminar in Entomology 1(1,0)

810 Selected Topics 1-4(1-4,0)

812 Entomological History and Literature 1(1,0)

840 Insect Ecology 3(2,3)

853 Applied Systematics 3(2,3)

856 Medical Entomology 3(2,3)

860 Insect Pest Management 3(3,0)

861 Insecticide Toxicology 3(2,3)

863 Special Problems in Entomology 1-3(0,3-9)

870 Advanced Insect Physiology 3(2,3)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

ENVIRONMENTAL SCIENCE (EN SC)

Professors: E. M. Baines, A. W. Elzerman, *Director;* R. E. Franklin, W. H. Leonard, J. E. Schindler, T. B. Yandle, Jr.; *Associate Professor:* W. F. Steirer, Jr.; *Assistant Professor:* A. E. Miller

200 Introduction to Environmental Science 3(3,0) Basic principles of environmental science including ecology, energy, resources, waste management; and air, water, and soil pollution. Consideration of issues, specific cases, investigative approaches and remedial actions. *Preq:* Sophomore standing and either two semesters of freshman

chemistry or biology.

400 Studies in Environmental Science 3(3,0) Study of historical perspectives, attitudes, and government policy within the framework of environmental case studies to illustrate the interaction between human and natural factors as they mutually affect the environment and man's ability to deal with that environment. *Preq:* EN SC 200 or consent of instructor.

431, 631 Public Health Administration 3(3,0) A course designed to prepare one for a career in the environmental sciences, with positions in public health and pollution control. Topics included are public health organizations and regulations, public relations, psychology of public health administration, and the use of the communications media in educating the public on health problems.

432 Inspection Methods in Water and Solid Waste 3(2,3) Methods of disposal of liquid and solid wastes will be emphasized in regard to environmental quality control. Treatment plant methods will be discussed. Inspection techniques for adequate treatment is a basic approach.

471, 671 Man and His Environment 2(2,0) The interaction of man with his environment will be surveyed. Factors such as urbanization, population growth, pathogens, disease vectors, ionizing radiation, sewage disposal, and noise control will be considered. The effects of environmental contacts with air, water, food, and solid and liquid wastes will be emphasized. *Preq:* Consent of instructor.

472, 672 Environmental Planning and Control 2(2,0) Application of planning and control to effective environmental quality improvement. Water supply and treatment, wastewater treatment and disposal, solid waste disposal, air pollution abatement, and land use and zoning will be considered from the standpoint of control. Not intended for graduate students in engineering. *Preq:* Consent of instructor.

ENVIRONMENTAL SYSTEMS ENGINEERING (E S E)

Professors: A. R. Abernathy, *Acting Head;* A. W. Elzerman, R. A. Fjeld, C. P. Grady, Jr., J. C. Jennett, T. M. Keinath, T. J. Overcamp, F. L. Parker, R. K. White; *Assistant Professors:* C. D. Adams, K. J. Farley

401, 601 Environmental Engineering 3(3,0) Introduction to the field of environmental engineering. Topics include environmental phenomena, impact of pollutants in the aquatic environment, solid-waste management, air pollution control, radiological health, and simple water and wastewater treatment systems. *Preq:* Junior standing in engineering or consent of instructor. *Coreq:* E M 320 or consent of instructor.

402, 602 Water and Waste Treatment Systems 3(3,0) A study of the fundamental principles, rational design considerations, and operational procedures of the unit operations and processes employed in water and waste treatment. Both physiochemical and biological treatment techniques will be discussed. An introduction to the integration of unit operations and processes into water and waste treatment systems. *Preq:* E M 320 or consent of instructor.

408, 608 (AG E, AGRON) Land Treatment of Wastewater and Sludges 3(3,0) See AGRON 408.

410, 610 Environmental Radiation Protection I 3(3,0) Fundamental principles of radiological health and radiation safety. Topics include radiation fundamentals, basic concepts of environmental radiation protection, internal and external dosimetry, environmental dose calculations and radiation protection standards. *Preq:* Consent of instructor.

411, 611 Ionizing Radiation Detection and Measurement 2(1,3) Laboratory exercises in ionizing radiation measurements. Topics include nuclear electronics; counting statistics; radiation interactions; basic gas, scintillation, and semiconductor detectors; gamma spectrometry; health physics survey instrumentation; and thermoluminescent dosimetry. *Preq:* Consent of instructor.

430, 630 Air Pollution Engineering 3(3,0) Introductory course in air pollution and its control. Topics include air pollutants and effects, sources, dispersion models, engineering controls, and air-quality legislation. *Preq:* Senior standing in engineering or

physical sciences.

451, H451, 651 (AG E, FOR) Newman Seminar in Engineering 1(0,2) See AG E 451.

470, 670 Water Resources Engineering 3(3,0) Covers range of water resources development with emphasis on engineering aspects of traditionally important purposes of flood control, navigation, hydroelectric power, and reclamation. Stresses comprehensive, multiple purpose, and systems aspects of modern water resources development and management. Includes introduction to use of mathematical modeling and digital simulation in water resources planning and project design.

482, 682 (C E) Groundwater and Contaminant Transport 3(3,0) Basic principles of groundwater hydrology and transport of contaminants in groundwater systems; groundwater system characteristics; steady and transient flow; well hydraulics, design, and testing; contaminant sources, movement and transformations. *Preq:* E M 320. *Coreq:* E S E 401.

484, 684 (AG E, I E) Municipal Solid Waste Management 3(3,0) Introduction to the problems, regulations, collection, handling, recycling and disposal of municipal solid wastes in the urban and rural sectors. Emphasis will be on an integrated waste-management system with resource recovery, composting, incineration, landfill disposals and their costs. *Preq:* Senior standing in engineering or science or consent of instructor.

485, 685 Hazardous Waste Management 3(3,0) Introduction to the problems, regulations, treatment, and ultimate disposal of hazardous and toxic materials. Spill clean-up, groundwater transport, land disposal, incineration and treatment technologies are discussed. *Preq:* Senior standing in engineering or sciences.

491 Selected Topics in Environmental Engineering 1-3 A study of the dynamic role of environmental engineering in maintaining environmental quality. A comprehensive study of any phase of environmental engineering. *Preq:* Consent of department head.

701 Special Problems 1-6(1-6,0)

802 Environmental Engineering Principles 3(3,0)

803 Physicochemical Operations in Water and Wastewater Treatment Systems 4(4,0)

804 Biochemical Operations in Wastewater Treatment Systems 3(3,0)

805 Laboratory in Water and Wastewater Treatment Operations 2(0,6)

806 Integrated Design of Water and Wastewater Treatment Systems 4(4,0)

809 Industrial Wastewater Treatment 3(3,0)

812 Environmental Nuclear Engineering 3(3,0)

813 Environmental Radiation Protection Laboratory II 1(0,3)

831 Air Quality Monitoring 3(2,3)

832 Air Pollution Meteorology 3(3,0)

833 Air Pollution Control Systems 3(3,0)

843 Environmental Engineering Chemistry 3(3,0)

844 Environmental Engineering Chemistry Laboratory 2(1,3)

847 Advanced Topics in Environmental Engineering Chemistry 3(3,0)

849 Environmental Engineering Chemistry Laboratory 2(0,6)

850 Stream and Estuarine Analysis 3(3,0)

851 Biological Principles of Environmental Engineering 3(3,0)

852 Ecological Models 3(2,3)

856 Pollution of the Aquatic Environment 3(3,0)

857 Pollution of the Aquatic Environment Laboratory 1(0,3)

861 Environmental Systems Engineering Seminar 0-1(1,0)

862 Environmental Quality Case Study 1(0,3)

875 Water Resources Planning 3(3,0)

876 Water Resources Systems 3(3,0)

880 Environmental Risk Assessment 3(3,0)

881 Special Problems 1-4

883 Selected Topics in Environmental Engineering 1-4

884 Selected Topics in Environmental Engineering 1-4

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

ENVIRONMENTAL TOXICOLOGY (ENTOX)

Professors: R. J. Kendall, *Head;* R. Noblet; *Associate Professors:* K. R. Dixon, S. J. Klaine, T. W. La Point; *Assistant Professors:* G. P. Cobb, R. L. Dickerson, M. J. Hooper, C. P. Weisskopt; *Lecturer:* C. M. Bens; *Visiting Assistant Professor:* T. D. Bly

400, H400, 600 Wildlife Toxicology 3(3,0) Assessment of impacts of toxic substances on reproduction, health, and well-being of wildlife species; acute and chronic effects of agricultural chemicals, pesticides, hazardous waste, industrial waste, and oil releases will be discussed. *Preq:* BIOCH 210 or Organic Chemistry, one year of general biology, W F B 350 or consent of instructor.

421, H421, 621 Chemical Sources and Fate in Environmental Systems 3(3,0) Chemical cycles in the environment will be discussed on global and microcosm scales. The dependence of fate processes on physical and chemical properties and environmental conditions will be examined. Breakdown, movement, and transport of selected toxicants will be addressed to illustrate the mechanisms that govern chemical fate. *Preq:* Organic and analytical chemistry or consent of instructor.

430, 630 (ENT) Toxicology 3(3,0) See ENT 430.

805 Mechanistic Toxicology 3(1,6)

806 Advanced Environmental Toxicology 3(3,0)

822 Analytical Toxicology Laboratory 3(1,6)

831 Biomarkers in Toxicology 3(1,6)

854 Aquatic Toxicology 3(3,0)

860 Graduate Seminar 1(1,0)

861 Departmental Seminar 1(1,0)

863 Selected Topics in Environmental Toxicology 1-4(1-4,0)

891 Masters Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

EXPERIMENTAL STATISTICS (EX ST)

Professors: P. M. Burrows, L. W. Grimes, H. S. Hill, Jr., *Acting Head; Associate Professors:* W. C. Bridges, Jr., J. E. Toler; *Assistant Professor:* J. R. Rieck; *Instructor:* R. M. Martinez

301 Introductory Statistics 3(2,2) Basic concepts and methods of statistical inference; organization and presentation of data, elementary probability, measures of central tendency and variation, tests of significance, sampling, simple linear regression and correlation. The role of statistics in interpreting research, and the general application of the methods are stressed. Credit will be given toward graduation for only one of the following: EX ST 301, MTHSC 301, 302.

411, 611 Statistical Methods for Process Development and Control 3(3,0) Experimental design techniques for use in process development, application of screening experiments and response surface experiments, techniques for process control with implications for product quality control. Includes discussions of the use of statistical computer analyses and interpretations including computer generated graphics. *Preq:* MTHSC 206 or consent of instructor.

462, 662 Statistics Applied to Economics 3(3,0) Continuation of EX ST 301 with emphasis on statistical methods used in the collection, analysis, presentation and interpretation of economic data. Special attention is given to time series analysis, the construction of index numbers and the designing of samples for surveys in the social science fields. *Preq:* EX ST 301.

801 Statistical Methods 4(3,3)

803 Regression and Least Squares Analysis 3(3,0)

804 Sampling 3(3,0)

805 Design and Analysis of Experiments 3(3,0)

811 Special Problems in Experimental Statistics 1-3(0,2-6)

812 Special Topics in Experimental Statistics 1-3(1-3,0)

FINANCE (FIN)

Professors: R. H. Mabry, *Head;* M. W. Marr, Jr.; *Associate Professors:* S. W. Barnhart, J. M. Harris, Jr., R. H. Klein, R. B. McElreath, Jr., S. N. Rosenstein, M. F. Spivey; *Assistant Professors:* J. C. Alexander, Jr., Y. Kim, J. M. Miller, U. V. Sridharan, N. G. Waller; *Visiting Instructor:* J. R. Rouse; *Lecturer:* M. H. Dehner

101 (ACCT) Accounting and Finance Orientation 1(1,0) See ACCT 101.

210 Introduction to Investments 3(3,0) Examination of the basics of various investment alternatives. Course is aimed toward the nonbusiness major. Credit may not be received for both FIN 210 and 305.

304 (ECON) Risk and Insurance 3(3,0) Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints. Topics include probability, theory of the firm under uncertainty, insurance carriers and contracts, underwriting, and regulation. *Preq:* ECON 200, 211, or consent of instructor.

305 (ECON) Investment Analysis 3(3,0) A study of techniques useful in analyzing alternative investment opportunities with emphasis on corporate securities. Investment planning and portfolio management are considered. *Preq:* FIN 306 or 311 or consent of instructor.

306 Corporation Finance 3(3,0) Introduction to financial management of nonfinancial firms. Includes such topics as analysis of financial statements, financial forecasting, capital budgeting, working capital management, and long-term financing decisions. Credit may not be received for both FIN 306 and 311. *Preq:* ACCT 200 or 202 or 203, or consent of instructor.

307 Principles of Real Estate 3(3,0) A course to acquaint the student with the theories, practices, and principles which govern real estate markets. Major emphasis will be placed on three areas: (1) specifics of real estate brokerage, property rights and ownership; (2) making real estate investment decisions; and (3) financing real estate investments. *Coreq:* FIN 306 or 311 or consent of instructor.

308 Financial Institutions and Markets 3(3,0) A study of financial institutions and markets with emphasis upon the role of financing American industry. *Preq:* ECON 302, FIN 306 or 311.

311, H311 Financial Management I 3(3,0) First of a two-course sequence designed to provide indepth exposure to the theory and practice of corporate financial management and to demonstrate how financial management techniques are applied in decision-making. Credit cannot be received for both FIN 306 and 311. *Preq:* ACCT 202 and MTHSC 203 or 301.

312, H312 Financial Management II 3(3,0) Continuation of the two-course sequence that begins with FIN 311. *Preq:* Fin 311 or 306 with approval of a Finance Department adviser.

402, H402 Asset Management 3(3,0) A study of the decision process and analytical techniques used in evaluating corporate investment decisions, including both long-term capital investments and working capital management. Computer-based financial decision making will be used. *Preq:* FIN 312 or consent of instructor.

404, H404 Management of the Corporate Capital Structure 3(3,0) Financial policy, theory, and cases dealing with the use of debt financing, dividend policy, convertible securities, mergers and acquisitions, leasing, and special topics. *Preq:* FIN 312 or consent of instructor.

405, 605 Portfolio Management and Theory 3(3,0) Introduction to portfolio management. Includes the underlying theory, managing the equity and the fixed-income portfolios, portfolio evaluation, options-pricing theory, future markets and instruments. *Preq:* FIN (ECON) 305 and either 306 or 311; or consent of instructor.

406, 606 Stock Options and Futures Markets 3(3,0) Consideration of the option pricing theory and strategy techniques most commonly used in the market for options. An overview of the futures markets is also considered. Special emphasis given to interest-rate futures, stock-index futures, and foreign-exchange futures. *Preq:* FIN (ECON) 305 or consent of instructor.

408 Management of Financial Institutions 3(3,0) Detailed study of the operational, marketing, and regulatory aspects of the management of depository financial institutions. Emphasis will be placed on decision making through the extensive use of cases. *Preq:* FIN 308.

410, H410, 610 Research in Finance 1-3 Directed research course for students interested in a career in finance. Research topic selected by student and approved by instructor. A formal research paper is required. *Preq:* FIN 306 or 312 and consent of instructor.

411 International Financial Management 3(3,0) Extension of the principles of finance to the international context. Course focuses on the implications of the existence of multiple currencies and the operations across borders of sovereign nation-states for the multinational corporation. *Preq:* FIN 312 or consent of instructor.

415, 615 Real Estate Investment 3(3,0) Course focuses upon the structure and analysis of real estate investment emphasizing financial theory and analysis technique. Case study and project-oriented homework assignments facilitate the understanding of real estate investments. *Preq:* FIN 307 and 306 or 311.

417, 617 Real Estate Finance 3(3,0) Advanced course applies financial analysis and theory to real estate. Mortgage credit analysis and current financing techniques for residential and commercial properties are emphasized. Topics include financial institutions, syndications and construction financing. *Preq:* FIN 307 and 306 or 311.

807 (M B A) Financial Management 3(3,0)

812 (M B A) Financial Markets and Institutions 3(3,0)

831 (M B A) Computer Applications in Financial Management 3(3,0)

832 (M B A) International Financial Management 3(3,0)

834 (M B A) Advanced Financial Management 3(3,0)

835 (M B A) Investment Management 3(3,0)

836 (M B A) Real Estate Finance and Investments 3(3,0)

FOOD SCIENCE (FD SC)

Professors: J. C. Acton, R. D. Galyean, *Head;* M. E. Kunkel, J. G. Surak, R. L. Thomas, T. C. Titus, W. P. Williams, Jr.; *Associate Professors:* S. F. Barefoot, P. J. Vergano; *Assistant Professors:* F. H. Barron, P. L. Dawson; *Instructor:* E. C. Turner; *Adjunct Professor:* C. R. Barmore

101 Epochs in Man's Struggle for Food 1(1,0) A study of significant developments in food preservation methods and the impact each has had on man's struggle for food.

201 Man and His Food 2(2,0) Study of food and food products with emphasis on nutrients, nutrient needs, and the relationship between nutrient intake and health. Also discussed are food additives, nutritional awareness (to include nutrition labeling), food protection, and the influence of processing on nutritional quality of food.

212 Man's Food Resources 2(2,0) Food material resources with reference to quality preservation, processing, and nutritional requirements. The role of science and technology in the modern food industry is emphasized. The need for food standards and

grades is explained, and the functions of grading and regulatory agencies are discussed.

305, H305 Engineering Principles for Food Processing 3(2,3) Study of basic engineering principles and their application in food processing operations. The relationship between engineering principles and fundamentals of food processing is emphasized. Topics include units, dimensions, steam properties, thermodynamics, mass and energy balances, fluid mechanics, heat transfer, refrigeration, mass transfer, and electricity. *Preq:* CH 102 or 112, MTHSC 105, PHYS 207 or 221, or consent of instructor.

306 Food Service Operations 3(3,0) Principles of management of resources in commercial food-service systems. Emphasis will be on types of delivery systems, principles of quantity food production, techniques for cost control and concepts of food science and food safety. *Preq:* FD SC 201 and Junior standing or consent of instructor.

401, H401, 601 Food Chemistry I 4(3,3)F Even-numbered years. The basic composition structure, and properties of food and the chemistry of changes occurring during processing utilization. *Preq:* BIOCH 210 or consent of instructor.

402, H402, 602 Food Chemistry II 4(3,3)S Odd-numbered years. Application of theory and procedures for quantitative and qualitative analysis of food ingredients and food products. Methods for protein, moisture, lipid, carbohydrate, ash, fiber, rancidity, color and vitamin analyses and tests for functional properties of ingredients are examined. *Preq:* BIOCH 210 or consent of instructor.

403, 603 Food Preservation and Processing I 3(3,0)F Odd-numbered years. Food preservation and processing by refrigerated and frozen storage, thermal processing and pasteurization, dehydration and concentration, fermentation, radiation, microwave heating and chemical preservatives. *Preq:* Physics and organic chemistry or biochemistry.

404, 604 Food Preservation and Processing II 3(3,0)S Even-numbered years. Principles of food preservation applied to flow processes, ingredient functions, and the importance of composition and physical characteristics of foods related to their processing. Product recalls and product development concepts. *Preq:* Physics and organic chemistry or biochemistry.

405, 605 Food Preservation and Processing Laboratory I 1(0,3)F Odd-numbered years. Laboratory exercises on preservation methods, equipment utilized, and processes followed in food manufacture. *Coreq:* FD SC 403.

406, 606 Food Preservation and Processing Laboratory II 1(0,3)S Even-numbered years. Continuation of FD SC 405 with greater emphasis on processes followed in food manufacture. *Coreq:* FD SC 404.

417 Seminar 1(1,0) Literature research and oral presentation of current food science topics.

418 Seminar 1(1,0) Literature research and oral presentation of current food science topics.

420, H420 Special Topics in Food Science 1-3(1-3,0) Comprehensive study of special topics in food science not covered in detail or contained in other courses. Contemporary developments in each topic area will be stressed. Maximum of 3 credits may be taken. *Preq:* Consent of instructor.

421, H421 Special Problems in Food Science 1-4(0,3-12) Independent research investigation in food science related to processing, preservation, packaging, or nutritional aspects of foods. Special emphasis will be placed on organizing a research proposal, conducting the research, and reporting the findings. Maximum of 4 credits may be taken. *Preq:* Senior standing or consent of instructor.

422, 622 Quality Assurance and Sensory Evaluation 2(2,0)S Even-numbered years. Principles of food quality assurance programs with emphasis on the elements of sensory evaluation testing, sampling, inspections, federal and trade standards/grades, records and EVOP procedures.

424, 624 Quality Assurance and Sensory Evaluation Laboratory 1(0,3)S Even-numbered years. Continuation of FD SC 422. The mechanics of quality assurance laboratory methods with emphasis on sensory evaluation panel testing, scoring, kinesthetic prop-

erties, and grade-quality measurements.

464, H464, 664 Food Packaging Systems 3(3,0) Characteristics and application of various materials and systems used in the packaging of foods. Engineering properties of the materials and methods used to measure properties are emphasized. Consideration is given to packaging systems for specific food applications. *Preq:* Consent of instructor.

466, 666 Food Packaging Systems Laboratory 1(0,3) Laboratory and field exercises on food packaging operations and packaging materials. Methods to evaluate the physical and chemical properties of packaging materials will be emphasized. *Preq:* Consent of instructor.

491 Practicum 1-4 Supervised experiential opportunities in the food industry. *Preq:* Junior standing and consent of department head.

802 Food Enzymology 2(2,0)

804 Thermal Processing of Packaged Foods 3(3,0)

810 Chemical and Biochemical Aspects of Foods 4(4,0)

811 Physical and Thermo-Physical Properties of Food 3(3,0)

812 Microbiological Aspects of Food Systems 3(3,0)

820 Special Topics in Food Science 1-3(1-3,0)

821 Special Problems in Food Science 1-3(0,3-9)

851 Food Science Seminar 1(1,0)

852 Food Science Seminar 1(1,0)

891 Master's Research. Credit to be arranged.

FOOD TECHNOLOGY (FD TH)

851 Food Technology Seminar 1(1,0)

991 Doctoral Disseration Research 1-6(0,1-6)

FOREST RESOURCES (FOR)

Professors: G. R. Askew, Jr., B. H. Box, B. A. Dunn, D. C. Guynn, Jr., D. L. Ham, R. L. Hedden, D. N. Hon, D. D. Hook, G. D. Kessler, A. W. Lee, W. A. Leuschner, *Head;* G. E. Sabin, W. A. Shain, F. H. Tainter, D. H. Van Lear, T. M. Williams, T. E. Wooten; *Associate Professors:* C. A. Gresham, J. L. Haymond, A. P. Marsinko, L. R. Nelson, L. E. Nix, T. J. Straka; *Assistant Professors:* W. H. Conner, A. E. Miller, P. N. Peralta, V. B. Shelburne; *Instructor:* S. K. Nodine; *Lecturer:* J. H. Syme

101 Introduction to Forestry 1(1,0)F An informative sketch of forestry, forests, and forestry tasks of the nation; education and career opportunities for foresters.

102 Introduction to Forestry 1(1,0)S Continuation of FOR 101.

103 Society, Conservation, and Forestry 2(2,0)S Introduction to the historical philosophical, and role of forests and forestry in society; relationship of man, forest, and conservation; major forest issues; and professional communications with the public.

205 Dendrology 3(2,3)F Classification, nomenclature, and identification of the principal forest trees of the United States, their geographical distribution, ecological requirements, and economic importance. Field identification of native trees and commonly planted exotics in the Piedmont and surrounding areas. *Preq:* BIOL 103 or consent of instructor.

206 Forestry Ecology 3(2,3)S Study of the nature of forests and forest trees, how they grow, reproduce, and their relationships to the physical and biological environment. *Preq:* AGRON 202, BIOL 103, FOR 205 or consent of instructor.

209 (PRTM) Forest and Recreation Resources Application of the Microcomputer 3(2,3) See PRTM 209.

221 Wood Properties I 3(2,3)F The formation of wood in forest trees, gross and minute

characteristics of wood, defects in wood, variability in wood. *Preq:* BIOL 103 or consent of instructor.

222 Wood Properties II 3(2,3)S Wood in relation to moisture, heat, sound, light, and electricity; mechanical properties of wood; standard testing procedures for wood. *Preq:* FOR 221 or consent of instructor.

251 Forest Communities 2(0,6) Study of forest plant species and their successful status and habitat requirements with respect to landform, soil type, and other appropriate aspects of site classification. *Preq:* FOR 205 or consent of instructor.

252 Forest Engineering (Summer Camp) 3(0,9) Field and drafting practice in mapping, finding, and traversing boundary lines, road location, and forestry applications of surveying equipment and techniques. *Preq:* FOR 205 or consent of instructor.

253 Forest Resource Measurements I (Summer Camp) 3(0,9) Practical application of field techniques, including timber cruising, measuring tree heights and volumes, constructing volume tables, and boundary-line surveys. *Preq:* FOR 205 or consent of instructor.

254 Forest Products (Summer Camp) 1(0,3) A tour of the forest products industry of South Carolina with an emphasis on those products and processes of some distinction or special interest. *Preq:* FOR 205 or consent of instructor.

255 Secondary Wood Products (Summer Camp) 1 A tour of the secondary wood products industries with an emphasis on industries too far from Clemson for the usual half-day field trips during regular sessions. *Preq:* FOR 205 or consent of instructor.

257 Forest Products Measurements (Summer Camp) 2 Measurements and classifications of a variety of wood products, from trees to finished products. *Preq:* FOR 221, 222 or consent of instructor.

258 Introduction to Forest Pests 1(0,3) Introduction to forest insects and disease pests with emphasis on their identification and recognition of their damage. *Preq:* FOR 205 or consent of instructor.

300 Christmas Tree Production 2(2,0)F Theory and practice of establishing, managing, and marketing trees with an emphasis on Christmas tree production in the South. *Preq:* Consent of instructor.

301 Wood in Everyday Life 2(2,0)F Introduction to the properties and uses of wood. The course is general in nature and covers such topics as identifying, machining, finishing, and treating wood, furniture construction, and the techniques used in manufacturing a variety of wood products. Not open to Forest Products majors.

302, 602 Forest Resource Measurements II 3(2,3)S Practical application of statistical and mensurational techniques in forest management. *Preq:* EX ST 301, FOR 253 or consent of instructor.

304, 604 Forest Resource Economics 3(3,0)F Economic problems and principles involved in the utilization of forest resources and in the distribution of forest products; analysis of integrated forest operations. *Preq:* ECON 200 or consent of instructor.

305 Elements of Forestry 3(2,2)F,S A compendium of forestry subjects providing a broad view of the forest environment as it relates to ecology, management and utilization of forests, especially those of South Carolina. Field and laboratory exercises in the fundamentals of forest-land management. Not open to Forest Resource Management majors. *Preq:* BIOL 103 or consent of instructor.

306, 606 Wood and Wood Fiber Identification 2(1,3)F Macroscopic and microscopic identification, properties, and uses of selected economically significant timbers. *Preq:* BIOL 103 or consent of instructor.

308, 608 Aerial Photographs in Forestry 2(1,3)F Introduction to photographic measurements, aerial photointerpretations, mapping, and timber estimating. *Preq:* Forestry summer camp or consent of instructor.

309 Arboriculture, Tree Care, and Maintenance 3(3,0) Principles, practices, and problems of protecting and maintaining trees in urban and recreational areas. Examines the environmental and biological factors that affect trees in high-use areas, their management and cultural requirements, and the practices necessary for their protection

and care as valuable assets in the landscape. *Preq:* Junior standing or consent of instructor.

310, 610 Silviculture 4(3,3)S Theory and practice of establishing, maintaining, and harvesting forest stands in accordance with ecological and economic principles. *Preq:* FOR 206, Forestry Summer Camp, or consent of instructor.

311 Forest Products Marketing Practices 3(3,0) Study of marketing practices currently employed by the forest-products industry and the application of basic marketing principles and strategic concepts in the industry's present and future marketing environment. *Preq:* Junior standing or consent of instructor.

312 Reproduction of Forest Trees 2(1,3)S Odd-numbered years. Methods of reproduction in forest trees; seed propagation, propagation by rooting and grafting techniques; environmental requirements for propogation, media, and materials. The course covers theory and practical instruction, making use of indoor and outdoor propagating beds. Limited enrollment. *Preq:* FOR 205 or consent of instructor.

314 Harvesting and Forest Products 4(3,3) Harvesting of forest products, structure and properties of economically important timbers, and production and properties of primary forest products. *Preq:* Forestry summer camp or consent of instructor.

315 Woodland Ecology 3(3,0) Overview of the forest emphasizing the living and nonliving components of the woodland habitat. Understanding man's use of the forest and interpreting the signs of plants, wildlife, and landscapes.

321 Drying and Machining of Wood 3(2,3)F Wood seasoning principles and practices, seasoning defects, machinery, and preparation of wood for processing. *Preq:* FOR 221, 222, or consent of instructor.

322 Wood Adhesives and Finishes 2(1,3)S Theory of adhesion, chemical bonding, rheology, chemistry of adhesion, theory of finishes, exterior coatings and paints for wood. *Preq:* CH 101, 102, FOR 221.

323 Deterioration and Preservation of Wood 2(2,0)S Deterioration agents, deterioration of wood in use, control of deterioration in manufacturing, preservation processes, types of preservation, fire retardants.

324 Properties and Processing of Wood 3(3,0) Study of the anatomical, chemical, and physical properties of wood and wood-processing principles and practices. Not open to Forest Products majors. *Preq:* Junior standing or consent of instructor.

325 Chemical Aspects of Wood Utilization 3(2,1)F Fundamental physical, organic, and polymer chemistry is applied to chemical processing of wood. Structures, reactions, and applications of cellulose, hemicelluloses and lignin are discussed. *Preq:* CH 102 or consent of instructor.

400, 600 Public Relations in Natural Resources 3(3,0) Identifying relevant policies, their characteristics and acceptance to natural resource management and techniques of maintaining appropriate public relations. *Preq:* Senior standing.

401 Silviculture I 3(2,3) Discussion of the theory and practice of establishing, maintaining, and harvesting forest stands in accordance with ecological and economic principles. *Preq:* FOR 206 and Forestry summer camp or consent of instructor.

402 Silviculture II 3(2,3) Discussion of forest management practices that affect ability of the land to produce multiple forest resources, with emphasis on water, nutrients, and fire. *Preq:* FOR 401 or consent of instuctor.

403, 603 Forest Soils Seminar 1(1,0)S Study of forest soil characteristics with respect to site evaluation forest fertilization, planting problems, watershed management, tree-soil-microorganism interactions, and trafficability. *Preq:* Junior standing or consent of instructor.

405, 605 Forest Influences 2(2,0)F Examination of the effect of forests and forestry on climate, water, soil, organisms, and humans. Reviews forest influences in relation to current environmental legislation and debate. *Preq:* FOR 206 or consent of instructor.

406 Forested Watershed Management 2(2,0) Covers a basic discussion of processes and measurement of water flow on forested watersheds. Forest land management is stressed to assure adequate water quantity and quality. The role of water in nutrient cycling and forest growth will also be discussed. *Preq:* FOR 315 or 401 or consent of in-

structor.

407, 607 Forest Operations 3(2,1)F Theory and practice of conducting forestry operations. Major emphasis on the methods, analysis of associated cost, and productive rates for timber harvesting and other mechanized field operations. *Preq:* Senior standing or consent of instructor.

409, 609 Multiple-Use Forestry 2(2,0)S Study of the demand placed on forests for a variety of products and uses, and how these can and must be reconciled in planning the management of each forest. *Preq:* Senior standing or consent of instructor.

411, 611 Harvesting Forest Products 3(2,3)S Application of engineering and cost-analysis techniques to the evaluation of the forest transport system and various harvesting situations. *Preq:* FOR 407 or consent of instructor.

412, 612 Forest Protection 2(2,0)S Prevention and suppression of forest fires; their effect upon the environment and people; factors affecting fire behavior; and use of fire in resource management. *Preq:* Senior standing or consent of instructor.

413, 613 Integrated Forest Pest Managment 3(3,0)F Nature and control of pests of forest trees and products. Will focus on the relation of pests to silviculture, management, and natural forest ecosystems. *Preq:* Junior standing in Forest Resource Management.

414, 614 Forest Management Plans 2(2,0)S Analysis of factors entering into forest working plans of several forestry organizations; preparation of a preliminary management plan of a sample area. *Preq:* FOR 417.

415, 615 Forest Wildlife Management 3(2,3)F Principles, practices, and problems of wildlife management with emphasis on upland forest game species. Habitat manipulation through use of appropriate silvicultural practices in association with other techniques are evaluated. *Preq:* FOR 310 or consent of instructor.

416, 616 Forest Policy and Administration 2(2,0)S Introduction to the development, principles, and legal provisions of forest policy in the United States, and an examination of administrative and executive management in forestry.

417, 617 Forest Resource Management and Regulation 3(3,0) Fundamental principles and analytical techniques in the planning, management, and optimization of forest operations. *Preq:* FOR 302, 304, 308, 310, and Forestry summer camp.

418 Forest Resource Valuation 2(2,0) Analysis of capital investment tools and their application to decision making among forestry investment alternatives; valuation of land, timber, and other resources associated with forestry, including the impact of inflation and taxes. *Preq:* FOR 304 or consent of instructor.

419 Senior Problems 1-3(1-3,0) Problems chosen with faculty approval in selected areas of forestry. *Preq:* Senior standing.

420, 620 Forest Products 3(2,3)S Primary forest products including lumber, poles and piles, veneers and plywoods, secondary wood products; chemically derived products from wood including pulp and paper, distillation products, wood hydrolysis; miscellaneous and minor forest products. *Preq:* FOR 306, Forestry Summer Camp, or consent of instructor.

421, 621 Biology and Silviculture of Hardwood Forests 2(1,2)F Study of the silvics, growth, and development of major hardwood species of North America that will relate these biological characteristics to the ecology, silviculture, and utilization of the hardwood forests of the Eastern United States. *Preq:* FOR 205, 206, 306, 310, or consent of instructor.

422, 622 Forest Products International Trade 3(3,0) Study of major supply regions, major trade flows, international demand, trade patterns, and industry structure and practices involved in international trade of forest products. *Preq:* Senior standing or consent of instructor.

423, 623 Current Issues in Natural Resources 2(2,0)F Lectures in various fields of forestry delivered by selected representatives from forest industries, consultants, agencies, associations, and other forestry operations. Course will not be taught when enrollment is less than 15. To be taken Pass/Fail only. *Preq:* Junior standing or consent of instructor.

424, 624 Forest Genetics and Tree Breeding 3(3,0)S Even-numbered years. History of genetics and breeding in forestry and its relation to silviculture; natural variation, hybridization and inheritance in forest trees; tree breeding objectives and methods. *Preq:* GEN 302 or equivalent, or consent of instructor.

425 Forest Resource Management Plans 3(2,3) Development of multiple resource forest management plans. Economic and environmental impacts of implementing management plans. *Preq:* FOR 417 or consent of instructor.

429, 629 Wood Design 3(2,3)F The technical mechanical properties of wood; load analysis and design criteria; design of structural elements in wood. *Preq:* FOR 328 or consent of instructor.

430, 630 Composite Wood Materials 3(2,3)F Manufacturing methods, physical and mechanical properties, and uses of wood-polymer composites, wood laminates, plywood, particleboard, fiberboard, reconstituted board products, structural sandwich panels, paper-base plastic laminates, and extruded and molded products. *Preq:* FOR 222 or consent of instructor.

431, 631 Recreation Resource Planning in Forest Management 2(1,3)S Odd-numbered years. Analysis of forest recreation as a component of multiple-use forest management; techniques of planning; physical and biological effects on forest environments; and forest site, user, and facility management.

432, 632 Forest Site Capability 2(2,0)S Analysis of use pressures on the forest land base and their effects on the capability of the forest to satisfy resource demands. Productivity and sensitivity of sites will be discussed. *Preq:* Senior standing in Forestry or consent of instructor.

434, 634 Foreign Woods and Their Properties 2(1,3)S Identification of commercially important foreign woods imported into the United States, their macroscopic and microscopic features, basic wood properties, and use. *Preq:* FOR 221, 306, consent of instructor.

435, 635 Park and Forest Structures 2(2,0)F Selection, processing, protection, and maintenance of wood used in park and forest structures. *Preq:* Senior standing or consent of instructor.

436, 636 Wood as an Energy Source 2(2,0)S Study of the availability, characteristics, and processing required for using wood and bark as a source of energy. *Preq:* Senior standing or consent of instructor.

451, H451, 651 (AG E, E S E) Newman Seminar in Engineering 1(0,2) See AG E 451.

491 Senior Thesis I 2(0,6) Individual forestry research for students in the Forest Science study area which focuses on developing a plan of research under the direction of a faculty member. *Preq:* Election of Forest Science study area and Senior standing.

492 Senior Thesis II 2(0,6) Individual forestry research project for students in the Forest Science study area that focuses on data collection, analysis, report writing, and oral presentation. *Preq:* FOR 491.

707 Special Problems 1-3(1-3,0)

801 Data Processing in Forestry Problems 3(2,3)

802 Advanced Mensuration 3(2,3)

803 Photo Interpretation 3(2,3)

804 Advanced Forest Economics 3(2,3)

805 Forest Landscape Ecosystems 4(3,3)

806 Advanced Silviculture—Forest Tree Growth and Development 3(3,0)

807 Special Problems In Forestry. Credit to be arranged.

808 Seminar 1(1,0)

809 Products Biodeterioration 3(2,3)

810 Forest Landscape Ecosystems of the Great Smoky Mountains 2(1,1)

811 Forest Wetland Ecology and Management 2(2,0)

814 Advanced Forest Resource Management and Planning 3(3,0)

825 Wood Chemistry 3(2,3)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

FRENCH (FR)

Professors: M. Cranston, R. R. McGregor, Jr., H. E. Stewart; *Associate Professors:* J. C. Bednar, D. J. Calvez, P. R. Heusinkveld, S. C. King, J. A. McNatt, K. M. Szmurlo; *Assistant Professor:* J. B. Macy; *Instructor:* R. Willingham; *Visiting Instructors:* C. D. Mauldin, M. Pichot

101 Elementary French 4(3,1) A course for beginners in which, through conversation, composition, and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

102 Elementary French 4(3,1) Continuation of FR 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

151 French for Graduate Students 3(3,0) Intensive program only for graduate students preparing for the reading examination in French. A minimum grade of B on a final examination will satisfy graduate school foreign language requirement. May be repeated once for credit. To be taken Pass/Fail only. *Preq:* Graduate standing.

190 Study and Travel Abroad Preparation 1(1,0) Designed to prepare students for study/travel in French-speaking countries. Students will be sensitized to cross-cultural differences and will be provided with practical skills and sources of information. Taught mainly in English. To be taken Pass/Fail only.

196 Practicum in French 1(0,1) On-campus program of teaching foreign languages to children. Students work under the supervision of faculty in planning and teaching one 45-minute class per week to children in grades 1-8. May be repeated for a total of 3 credits. *Preq:* Third-year language standing or consent of department head.

201, H201 Intermediate French 3(3,0) A brief review of FR 101 and 102, with conversation, composition, and dictation, and the reading of more serious short prose pieces in French. *Preq:* FR 102.

202, H202 Intermediate French 3(3,0) While attention is paid to writing and speaking French, more stress is laid on the rapid reading of more difficult French prose than in the earlier courses. *Preq:* FR 201.

205 Elementary French Conversation and Composition 3(3,0) Intensive oral and written training in French through conversation groups, speeches, written composition, and controlled vocabulary acquisition. Required of all French majors and minors. May be taken concurrently with FR 202, 301 or 302. *Preq:* FR 201.

299 Foreign Language Drama Laboratory 1(0,3) Participation in foreign drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a total of 3 credit hours. *Preq:* Consent of instructor directing the play.

301 Survey of French Literature I 3(3,0) French literary movements and authors of the 19th and 20th centuries. *Preq:* FR 202.

302 Survey of French Literature II 3(3,0) French literary movements and authors from the Middle Ages through the 18th century. *Preq:* FR 202.

305 Intermediate French Conversation and Composition I 3(3,0) Practice in the spoken language, with stress on vocabulary building, pronunciation, intonation, and comprehension; written work to increase accuracy. Assignments in the language laboratory. *Preq:* FR 202 or consent of department head.

307 French Civilization 3(3,0) Study of significant aspects of the culture of France from its origins to 1945. *Preq:* FR 202 or consent of department head.

308 Contemporary French Culture and Civilization 3(3,0) Study of significant aspects of the culture of France from 1945 to the present. *Preq:* FR 202 or consent of department head.

309 Introduction to French Phonetics 3(3,0) Study of the fundamental principles of the pronunciation of French through the use of the International Phonetic Alphabet and recordings. *Preq:* FR 202 or consent of department head.

316 French for International Trade I 3(3,0) Spoken and written French common to the French-speaking world of business and industry, with emphasis upon business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analyses of American and French cultural patterns in a business setting. *Preq:* FR 202 and 305 (either preq or concurrently); or consent of department head.

398 Directed Reading 1-3(1-3,0) Directed study of selected topics in French literature, language, and culture. May be repeated for a maximum of 6 credits. *Preq:* Consent of department head.

403 Twentieth-Century French Prose and Poetry 3(3,0) The major literary themes and genres of the period and their influences upon other art forms. *Preq:* FR 301 or 302.

404 Twentieth-Century French Drama 3(3,0) Survey of French drama and its relationship to other literary and art forms. *Preq:* FR 301 or 302.

406 Nineteenth-Century French Literary Movements 3(3,0) Study of genres representative of the literary theories which contributed to the great diversity of the literature, painting, and music of the period. *Preq:* FR 301 or 302.

407 Eighteenth-Century French Literature 3(3,0) The principal literary figures of the 18th-century, with particular emphasis on Voltaire and Rousseau. *Preq:* FR 301 or 302.

408 Seventeenth-Century French Literature 3(3,0) Major literary figures, themes, and forms of 17th-century French literature. *Preq:* FR 301 or 302.

409 Advanced Grammar and Composition 3(3,0) Intensive study of syntax and stylistics through composition and translations. *Preq:* Senior standing or consent of department head.

411 Advanced French Conversation and Composition 3(3,0) Continuation of FR 305, with emphasis on greater fluency and sophistication in oral and written expression. *Preq:* FR 305 or consent of instructor.

416 French for International Trade II 3(3,0) Study of language and cultural environment of the French-speaking markets of the world, including the linguistic and cultural idioms which support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. *Preq:* FR 316.

498 Independent Study 1-3(1-3,0) Directed study of selected topics in French literature, language, and culture. May be repeated for a maximum of 6 credits. *Preq:* Consent of department head.

499, 699 Selected Topics in French Literature 3(3,0) Selected topics that have characterized French literature, language, and culture. May be repeated for a maximum of 6 credits. *Preq:* Consent of department head.

GENETICS (GEN)

Professors: S. R. Chapman, W. D. Graham, Jr., R. H. Hilderman, J. S. Rice, E. R. Shipe; *Associate Professors:* A. G. Abbott, W. C. Bridges, Jr., H. T. Skorupska, W. M. Surver, D. G. Yardley; *Assistant Professors:* W. V. Baird, N. H. Ferguson

301 Genetics and Human Affairs 3(3,0)S, SS Basic genetic principles emphasizing human heredity and the relationship of genetics to society. Discussion of chromosome abnormalities, inborn errors of metabolism, sex-related traits, genetic counseling, and other current genetic topics. Course is designed as an elective for students in nonbiological science majors. Will not substitute for GEN 302.

302, H302 Introductory Genetics 4(3,3) Basic course introducing fundamental principles of inheritance in prokaryotes and eukaryotes. Emphasis is given to

Mendelian genetics, physical and chemical basis of heredity, population genetics, and microbial genetics. *Preq:* One year of introductory biology and one semester of biochemistry or consent of instructor.

416, 616 (BIOSC) Molecular Genetics 3(3,0)S Designed to familiarize the student with the most current facts and concepts of molecular genetics. The lectures will focus on gene organization, structure, and expression in prokaryotes and eukaryotes, highlighting current technologies and research in these areas. *Preq:* GEN 302 or its equivalent and one semester of biochemistry or consent of instructor. A developmental biology course is also strongly recommended.

418, 618 (BIOSC, MICRO) Biotechnology I: Nucleic Acids Techniques 4(2,4) See BIOSC 418.

451, 651 Advanced Genetics 3(3,0)F Even-numbered years. Advanced study of the principles of general genetics. Topics emphasized are variations in chromosome number and structure, natural and induced mutations, extranuclear inheritance, recombination, control of gene activity, genes and development, genetics of behavior patterns, population genetics, systems of mating, genetics and man. *Preq:* GEN 302 or equivalent.

701 Modern Development in Genetics 3(3,0)

801 Cytogenetics 3(2,3)

803 Biometrical Genetics 3(3,0)

806 Special Problems in Genetics 1-3(0,3-9)

825 Genetics Seminar 1(1,0)

890 Special Topics in Genetics 1-3(1-3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

GEOGRAPHY (GEOG)

Associate Professor: J. A. Miller; *Assistant Professor:* T. G. Young

101 Introduction to Geography 3(3,0) Survey of the nature of geography, with emphasis on the discipline's organizing themes of earth science, relations between people and their environments, interrelations between places, locational analysis, and area studies.

102 Human Geography 3(3,0) The human role in changing the face of the earth. Human geography as an approach to understanding contemporary and historical human problems as a set of relations between population, resources, culture, and environment. A more detailed analysis of the human and cultural aspects of GEOG 101.

103 World Regional Geography 3(3,0) Systematic and descriptive survey of the major regions of the world, including their physical and cultural features. Provides a global context for courses in the social sciences and humanities.

301 Political Geography 3(3,0) Geographic basis of states: sovereignty, territory, power within states, relations between states. The geography of international affairs.

302 Economic Geography 3(3,0) Spatial analysis of economic activity, with an emphasis on regional economics and development. Topics include world population; technology and economic development; principles of spatial interaction; and geography of agriculture, energy manufacturing, and tertiary activities.

303 Urban Geography 3(3,0) Historical and contemporary survey of the urban world, with particular attention paid to the relationship between people and urban places. Topics include the rise of cities, urban hierarchies, urban land use, and the social geography of cities.

305 Cultural Geography 3(3,0) Broad examination of the basic cultural variables in the human occupation of the earth. Ecological, spatial, regional, and historical approaches; topics vary but may include cultural areas and distributions, cultural change, cultural landscape, and cultural ecology.

310 Computer Mapping 3(3,0) Introduction to computer mapping and to microcomputer and mainframe computer mapping application packages.

330 Geography of the Middle East and North Africa 3(3,0) Thematic survey of a world region extending from Morocco to Afghanistan. Emphasis on climate, environment, social geography, historical development of the regional culture of Islam, and common problems facing the area today.

340 Geography of Latin America 3(3,0) Introduction to the physical, economic, political, and human/cultural geography of Latin America. Special focus on regional unity and diversity and on the historical interaction of man and environment.

350 Geography of South Carolina 3(3,0) Geographical perspective of the economic, social, and political development of South Carolina landscapes.

401, 601 Studies in Geography 3(3,0) Intensive study of the geography of a selected world region, such as North America, Europe, or the Middle East, or the geography of a topic such as the geography of oil or the geography of underdevelopment. With departmental permission, may be repeated once for credit. *Preq:* GEOG 101 or 102 or consent of instructor.

410, 610 Geography of the American South 3(3,0) Study of the geography of the American South in its changing complexities across almost 400 years of development.

420, 620 Historical Geography of the United States 3(3,0) Survey that places the spatial concepts of geography into a time sequence with special emphasis upon the United States.

499 Independent Study in Geography 3(3,0) Study of selected topics in geography under the direction of a faculty member chosen by the student. The student and faculty member develop a course of study designed for the individual student and approved by the head of the department prior to registration.

700 Topics in Geography 3(3,0)

710 Geography for Teachers 3(3,0)

GEOLOGY (GEOL)

Professors: V. S. Griffin, Jr., *Acting Head;* G. M. Haselton, D. S. Snipes, R. D. Warner; *Assistant Professor:* J. R. Wagner; *Visiting Professor:* W. C. Fallaw; *Visiting Associate Professor:* S. M. Benson; *Visiting Assistant Professor:* H. A. Fox, Jr; *Visiting Instructors:* J. L. Tinsley, R. D. White

101 Physical Geology 3(3,0) Study of the minerals and rocks which compose the earth's crust, their origins and transformations. Emphasis is placed upon geological processes, both internal and external, by which changes are produced on or in the earth.

102 Historical Geology 3(3,0) Survey of the geologic history of the earth. Emphasis is placed upon how earth's continents and ocean basins have evolved through geologic time. The evolution of life is traced from the beginning of the fossil record through the present. *Preq:* GEOL 101.

103 Physical Geology Laboratory 1(0,2) Laboratory to accompany GEOL 101. Instruction is provided in the identification of minerals and rocks and in the interpretation of geologic processes through study of topographic maps. Field trips provide direct observation of processes and results. *Coreq:* GEOL 101.

104 Historical Geology Laboratory 1(0,3) Laboratory to accompany GEOL 102. Instruction is provided in the identification of plants and animals which have left their record as fossils in the rocks of the earth's crust. Interpretation of the past history of the earth through study of geologic maps. Field trips illustrate principles. *Coreq:* GEOL 102.

210 Geology of the National Parks 3(3,0) Survey of selected national parks and monuments emphasizing the dynamic geological processes which have shaped the landscapes of these areas. Special attention will be focused on parks exhibiting recent geological activity related to volcanoes, earthquakes and glaciers. Slides and films will be used to highlight specific geological features.

220 (ASTR) Planetary Science 3(3,0) Survey of the formation and evolution of planetary bodies. Emphasis is placed upon the origin of planetary material and comparative

study of the primary processes operative on planetary surfaces. The major features of the planets and moons in our solar system, as revealed by recent space missions, are described.

306 Mineralogy 3(2,3) Introduction to fundamental concepts of crystallography and crystal chemistry. Topics include crystal symmetry, principles of crystal structures, introductory x-ray crystallography, composition and stability of minerals, and systematic mineralogy. Laboratory exercises emphasize the recognition of crystallographic features and identification of minerals based on their physical properties.

309, H309 Petrology 3(2,3) Genesis, evolution, and classification of rocks through lectures, laboratory exercises, and field trips. The occurrences, chemical relationships, and distribution of rock types are emphasized. *Preq:* GEOL 306.

400, 600 Environmental Geology 3(3,0) Discussion-oriented introductory study of the relationships of man to his physical surroundings and the problems resulting from upsetting the established equilibria of geologic systems; man's role as a geologic agent, environmental conservation and management.

401, 601 Applied Geophysics 3(2,2) Introduction to the most important methods of geophysical exploration and their application to the investigation of subsurface groundwater and mineral resources. Emphasis is on the principles, techniques, interpretations and limitations of magnetic, gravimetric, electrical, electromagnetic, well-logging and seismic geophysical surveys. *Preq:* GEOL 101 or consent of instructor; PHYS 208 or 221 recommended.

402, H402, 602 Structural Geology 3(2,2) The diverse geological structures of the earth, their description, origin, and field recognition. Practical problems in interpreting geologic structures are utilized, in addition to theoretical considerations of the mechanics and causes of tectonism. *Preq:* GEOL 101.

403, H403, 603 Invertebrate Paleontology 3(2,3) Study of life of past geologic ages, as shown by fossilized remains of ancient animals, with emphasis on the invertebrates. *Preq:* GEOL 101 or consent of instructor.

404, H404, 604 Economic Geology 3(3,0) This course concerns the description and classification of ore deposits and commercial nonmetallic mineral deposits. The origin of mineral deposits and their occurrence is emphasized. Problem studies and field trips to nearby mines and quarries. *Preq:* GEOL 306.

405, 605 Geomorphology 4(3,3) Study of the surface features of the earth—their form, nature, origin, development, and the change they are undergoing. *Preq:* GEOL 101, 102, or consent of instructor.

407, 607 Quaternary Geology 3(2,2) Early concepts about glaciation. Types and distribution of glaciers today and during their maximum extent. Glacial erosion, transportation and ice-sculptured terrain features. Study of quaternary sediments and their chronology. Drainage changes, sea-level fluctuations and crustal deformation. Detailed study of specific areas as time permits. Field trips.

408, 608 Geohydrology 3(3,0) Study of the hydrologic cycle, aquifer characteristics, theory of groundwater movement, mechanics of well flow, experimental methods, and subsurface mapping. *Preq:* GEOL 101,102.

410, H410, 610 Optical Mineralogy 3(1,5) Involves techniques of mineral identification with polarizing microscope. Criteria are provided for the determination of optical properties using oil immersion grain mounts. The student is also introduced to the study of minerals and rocks in thin section. Lecture topics explore mineral optics theory. *Preq:* GEOL 306.

411, 611 Research Problems 1-3(0,3-9) Field, laboratory, or library study of an approved topic in geology. Topic would be one not normally covered in formal courses, but may be an extension of a course. Taught either semester and may be taken more than once for a maximum of 6 credits. *Preq:* Senior standing or consent of instructor.

412, 612 Geochemical Analytical Techniques 3(1,4) Introduction to techniques of chemical analysis applied to earth materials. Emphasis is placed on the use of atomic absorption spectroscopy to analyze groundwater, soil and bulk rock samples, and electron probe microanalysis to determine mineral compositions. *Preq:* CH 101 and 102,

GEOL 306 or consent of instructor.

413, 613 Stratigraphy and Sedimentation 3(3,0) The processes by which sediments are eroded, transported, and deposited (sedimentation), with major emphasis on relationships of the age and time distribution of stratified rocks and their historical significance (stratigraphy). *Preq:* GEOL 101 and 102 or consent of instructor.

451, 651 Selected Topics in Hydrogeology 1-4(1-3,0-3) Selected topics in hydrogeology, with emphasis on new developments in the field. May be repeated for a maximum of 6 credits, but only if different topics are covered. *Preq:* GEOL 400 or 408, or consent of instructor.

700 Geology for Science Teachers 3(2,3)

740 Earth/Space Science for Elementary Teachers 3(2,3)

790 Selected Topics in Earth Science 1-6(0-6,0-18)

800 Ground-Water Geochemistry 3(2,3)

801 Ground-Water Geophysical Techniques 3(1,4)

802 Advanced Structural Geology 3(2,2)

804 Water Well Exploration, Drilling and Monitoring 3(2,2)

805 Advanced Stratigraphy 3(3,0)

808 Ground-Water Modeling 4(3,2)

809 Subsurface Remediation Modeling 3(3,0)

810 Analytical Methods for Hydrogeology 3(3,0)

850 Selected Topics in Environment Geology 1-4(1-3, 0-3)

851 Geology Seminar 1(1,0)

875 Hydrogeology Summer Field Camp 6(4,6)

891 Master's Research. Credit to be arranged.

GERMAN (GER)

Professors: H. M. Riley, M. M. Sinka; *Associate Professors:* E. P. Arnold, J. M. Melton, *Head; Visiting Instructor:* S. C. Freytag

101 Elementary German 4(3,1) A course for beginners in which, through conversation, composition and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

102 Elementary German 4(3,1) Continuation of GER 101; three hours a week of classroom instruction and one hour a week in the language laboratory.

151 German for Graduate Students 3(3,0) Intensive program only for graduate students preparing for the reading examination in German. A minimum grade of B on a final examination will satisfy graduate school foreign language requirement. May be repeated once for credit. To be taken Pass/Fail only. *Preq:* Graduate standing.

190 Study and Travel Abroad Preparation 1(1,0) Designed to prepare students for study/travel in German-speaking countries. Students will be sensitized to cross-cultural differences and will be provided with practical skills and sources of information. Taught mainly in English. To be taken Pass/Fail only.

196 Practicum in German 1(0,1) An on-campus program of teaching foreign languages to children. Students work under the supervision of faculty in planning and teaching one 45-minute class per week to children in grades 1-8. May be repeated for a total of 3 credits. *Preq:* Third-year language standing or consent of department head.

201, H201 Intermediate German 3(3,0) Brief review of GER 101 and 102, with conversation, composition and dictation, and the beginning of more serious reading of German prose in short stories and plays. *Preq:* GER 102.

202, H202 Intermediate German 3(3,0) Emphasis on reading nontechnical German

prose more rapidly. Writing, speaking, and listening skills will continue to be developed. *Preq:* GER 201 or consent of instructor.

251 Scientific German 3(3,0) An alternate course to GER 202, especially for students in the sciences. Readings will be chosen from various fields. Grammar and syntax will be reviewed to ensure accurate translations, but stress will be on reading for understanding. *Preq:* GER 201 or consent of department head.

299 Foreign Language Drama Laboratory 1(0,3) Participation in foreign language drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a total of 3 credits. *Preq:* Consent of instructor directing the play.

301 Twentieth-Century German Drama 3(3,0) Selected works from major German-speaking dramatists of the 20th century, including Brecht, Duerrenmatt, and Frisch. Required of German majors. *Preq:* GER 202 or consent of department head.

302 Twentieth-Century German Prose and Poetry 3(3,0) Selected prose and poetry from major 20th century German-speaking authors, including Rilke, Mann, Hesse, Kafka, and Boell. Required of German majors. *Preq:* GER 202 or consent of department head.

305 Intermediate German Conversation and Composition 3(3,0) Practice in the spoken language, with emphasis on vocabulary, pronunciation, and comprehension; written exercises for accuracy. Required of German majors. *Preq:* GER 202, 205, or consent of department head.

308 German Civilization 3(3,0) Study of significant aspects of the culture of the German-speaking peoples from their origins to 1945. *Preq:* GER 202 or consent of department head.

309 Modern German Culture 3(3,0) Study of modern German culture from 1945 to the present with particular emphasis on the Federal Republic of Germany and significant aspects pertaining to the German Democratic Republic. *Preq:* GER 202 or consent of department head.

316 German for International Trade I 3(3,0) Spoken and written German common to the German-speaking world of business and industry, with emphasis upon business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analysis of American and German cultural patterns in a business setting. *Preq:* GER 251 or 202 and 305 (preq or concurrently); or consent of department head.

398 Directed Reading 1-3(1-3,0) Directed study of selected topics in German literature, language, and culture. May be repeated for a maximum of 6 credits. *Preq:* Consent of department head.

400 Goethe and His Age 3(3,0) Study of the most significant period of German literature, with readings from works by Goethe, Schiller, and the Romantics. Supplementary materials may include audio visuals and documents on the music, art, and science of the period. Recommended for German majors. *Preq:* GER 301, 302, or consent of department head.

401 Studies in German Literature I 3(3,0) Selected topics in German literature from the beginning to 1832. *Preq:* GER 301, 302, or consent of department head.

402 Studies in German Literature II 3(3,0) Study of selected topics in 19th or 20th century German literature. *Preq:* GER 301, 302, or consent of department head.

403 Studies in German Literature III 3(3,0) Study of a major theme in German literature within a chosen time period or in the work of one major author. The themes may be subject- or genre-oriented. *Preq:* GER 301, 302, or consent of department head.

411 Studies in the German Language I 3(3,0) Advanced training in the spoken and written language with emphasis on vocabulary, syntax, and stylistics. *Preq:* GER 305 or consent of department head.

412 Studies in the German Language II 3(3,0) Indepth study of terminology and syntax for specific subject areas in business, in the liberal arts, and in the sciences. *Preq:* GER 301, 302, 305, or consent of department head.

413 Studies in German Culture 3(3,0) Intensive study of selected topics concerning cultural phenomena of the German-speaking nations. *Preq:* GER 301, 302, 305, or consent of department head.

416 German for International Trade II 3(3,0) Study of language and cultural environment of the German-speaking markets of the world, including the linguistic and cultural idioms which support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. *Preq:* GER 316.

498, 698 Independent Study 1-3(1-3,0) Supervised study of selected topics in German literature, language, or culture. May be repeated for a maximum of 6 credits. *Preq:* Consent of department head.

GRADUATE STUDIES (G S)

799 Comprehensive Studies 1-15

800 Research Proposal Development Seminar 1(1,0)

GRAPHIC COMMUNICATIONS (G C)

101 Orientation to Graphic Communications 1(1,0) Introduction to the curriculum and the industry including its processes, products, and careers. Emphasis is placed on the attributes which are most desirable for successful entry and advancement up a variety of career ladders.

104 Graphic Communications I 3(1,6) Major emphasis is placed on the basic principles underlying the graphic arts. Many areas of study include general photography, graphic layout and design, process photography, offset lithography, screen printing, and bindery. Modern industrial applications are stressed throughout the course.

207, H207 Graphic Communications II 3(1,6) Continuation of G C 104. An intermediate course for the graphic communications and graphic arts specialists which broadens skills and technical knowledge in areas of layout, copy preparation, reproduction photography, film assembly, screen printing lithographic presswork, and finishing. *Preq:* G C 101, 104, typewriter/computer keyboarding skills of 20 net words per minute.

304, H304 Photographic Techniques 3(1,6) Emphasis is placed on application of black and white photography as activities for vocation and avocation. Sufficient laboratory experiences are provided to assure confidence in the use of photographic techniques. Problems encountered in action, portrait, still life, and character-study photography are considered.

310, H310 Alternative Approaches to Imaging 3(1,6) Intended to promote the refining of skills learned in G C 104 and 207, with an in-depth study and application of computerized prepress systems and methodologies. It also serves as a transition course to the advanced graphic classes teaching offset lithography, flexography, screen printing, and gravure. *Preq:* G C 207 or consent of instructor.

350 Graphic Communications Internship I 1(0,3) Full-time supervised employment in an industrial in-plant setting for expansion of experience with materials and processes, production people, and organizations. *Preq:* G C 104 or 207 or equivalent and consent of instructor.

406, H406, 606 Problems in Specialty Printing 4(2,6) Study of the problems and converting in package label and specialty industries. Laboratory applications include flexographic preparation, printing and die cutting; die making and die cutting screen and offset printed sheet stock; sublimation and plastisol transfer printing; plastic and metal container printing. *Preq:* G C 207 and IN ED 240.

407, 607 Advanced Flexographic Methods 4(2,6) An in-depth study of the methods used in flexographic printing and converting of porous and nonporous substrates. Theory and laboratory applications include setting standards for process color, preparation of plate systems, ink mixing and color matching, testing of films and foils, analysis of recent developments, and prediction of future markets. *Preq:* G C 406 and 444 or consent of instructor.

410, 610 (H R D, IN ED) Selected Topics 1-3 (1-3,0) See IN ED 410.

440, H440, 640 Advanced Lithographic Methods 4(2,6) Students selecting to pursue the area of graphic arts will gain experience in the development of advanced techniques of layout and design; photographic copy preparation; cold type composition; line, halftone, duotone, and special-effects photography, full color reproduction and advanced platemaking; process stripping, and color offset presswork. *Preq:* G C 310 or consent of instructor.

444, H444, 644 Current Developments and Trends in Graphic Communications 4(2,6) Advanced course for Graphic Communications majors. Emphasis is placed on the theory and technical developments that affect process and equipment selection. Topics for study include color theory and application, electronic color scanning, electronic prepress and communications, gravure color quality control and analysis. *Preq:* G C 350 and 406, 440.

445, 645 Advanced Screen Printing Methods 3(2,3) In-depth study of the systems and materials used with the screen printing process. Emphasis is placed on techniques of control and procedures for establishing screen-printing methods and standards. *Preq:* G C 207 or consent of instructor.

446, 646 Ink and Substrates 3(2,3) Course covers the components, manufacturing, process use as well as end use of ink and substrates used in lithography, flexography, gravure and screen printing. It examines the interrelationship between inks, substrates, and the printing process. Through controlled testing and examination, the optimum conditions for improved printability will be determined. *Preq:* G C 406 or 440 or consent of instructor.

448, H448, 648 Planning and Controlling Printing Functions 3(3,0) Study of systems for setting printing production standards, estimating, scheduling, job planning, and the selection of new hardware and technologies. *Preq:* G C 350, 406, 440, 450.

450 Graphic Communications Internship II 1(0,3) Continuation of G C 350. *Preq:* G C 350, 440, and/or consent of instructor.

451 Special Projects in Graphic Communications 1-6(0,3-18) Advanced projects covering theory and/or practices going beyond the scope of regular coursework. Written project approval required before registering. *Preq:* Junior or Senior standing with three graphic communication courses completed.

455 Graphic Communications Internship III 1(0,3) Full-time employment in an industry directly or indirectly related to printing. The work site and job must be approved in advance. *Preq:* GC 450 and two 400-level graphic communication courses.

480 Senior Seminar in Graphic Communications 2(2,0) Study of the current trends and issues in the graphic communications industry. Class will center around group discussions dealing with relevant topics facing the graphic communications manager today. Students will be asked to draw upon academic experiences, internship experiences, and library research to facilitate discussion. Must be taken during the last semester on campus.

801 Process Control in Color Reproduction 3(2,3)

895 (IN ED) Special Problems I 3(3,0)

896 (IN ED) Special Problems II 3(3,0)

HEALTH (HLTH)

Associate Professor: D. B. Jackson, *Head; Assistant Professors:* K. A. Kemper, C. T. Rainey, C. Y. Schwartz; *Lecturers:* R. C. Alexander, D. J. Falta; *Adjunct Instructor:* E. P. Taylor

101 Introduction to Health Careers 1(1,0) Exploration of the variety of careers available in the health-care field.

103 Communication Principles 1(1,0) Communication principles and strategies for assessing individual, group, and community health will be introduced as related to the social diagnosis component of the PRECEDE-PROCEED Model. These strategies will also be applied in determining the effectiveness of health interventions through qualitative approaches.

202 Trends in Health Promotion 3(3,0) Examination of the forces that have influenced current health delivery systems, health practices and trends. General systems theory introduced.

240 Determinants of Health Behavior 3(3,0) Exploration of risk factors associated with health and wellness such as cognitive, emotional, cultural, biological, and environmental. Management skills in health promotion are introduced.

250 Health and Fitness 3(3,0) Study of interrelationship between health and fitness. Emphasis on the cardiovascular system and benefits of exercise.

298 Health Maintenance 3(3,0) Study of good health practices. Emphasis on lifestyles and measures of health.

299 Health Maintenance Appraisal 1(0,3) Utilizes laboratory experience to measure health risk, interpret laboratory health data, and design a personal health program. *Preq/Coreq:* HLTH 298.

301 Medications in Health 3(3,0) Exploration of the use of medications in the maintenance of health, with emphasis on the consumer's responsibility and informed decision-making. *Preq:* A two-semester sequence in science or consent of instructor.

303 Communication in Health Systems 3(3,0) Introduction to medical terminology, composing health reports, and health-funding proposals and media communications. *Preq:* HLTH 298.

305 Body Response to Health Behaviors 3(3,0) Positive benefits and the negative impact of certain behaviors at cellular, organ, and body-system levels are examined. The pathways of selected injury and disease are explored. Expected physiological changes are applied in identifying strategies for promoting health in the presence (or absence) of disease. *Preq:* BIOSC 223 or consent of instructor.

310 Women's Health Issues 3(3,0) Exploration of the specific health needs of women, with emphasis on understanding and prevention of problems of women's health. *Preq:* A two-semester sequence in science or consent of instructor.

320 Health Maintenance of Men 3(3,0) Exploration of the specific health maintenance needs of men, with emphasis on understanding and preventing problems of men's health. *Preq:* A two-semester sequence in science or consent of instructor.

340 Health Promotion and Education 3(3,0) Application of learning, change, and group theories as interventions for health behaviors. Emphasis is also placed on systems and stress theories. *Preq:* HLTH 240, 298. *Preq/Coreq:* ED 302.

380 Epidemiology 3(3,0) Introduction to epidemiological principles and methods utilized in the study of the origin, distribution, and control of disease. *Preq:* HLTH 298.

400, 600 Selected Topics in Health 1-3(1-3,0) Topics selected to meet special and individualized interest of students in health. May be repeated for a maximum of 6 credits, but only if different topics are covered. *Preq:* Consent of instructor, Junior standing.

401, 601 Health Consumerism 3(3,0) Exploration of consumer decisions regarding health products and services with emphasis on strategies for decision-making. *Preq:* A two-semester sequence in science or consent of instructor.

402, 602 Health Emergencies 3(3,0) Study of basic emergency care for people who are injured or suddenly become ill. Immediate first aid and follow-up care explored. Emphasis is on safety and the role of nonmedical personnel in caring for victims of accidents, disasters, poisonings, and life-threatening injuries. *Preq:* A two-semester sequence in biology or anatomy and physiology or consent of instructor.

410, 610 Concepts of Health for Children 3(3,0) Focus on the analysis and evaluation of health problems commonly occurring in children. Emphasis will be on concepts of positive health behavior. *Preq:* A two-semester sequence in science or consent of instructor.

430, 630 Health Promotion of the Aged 3(3,0) Exploration of psychological and physiological processes of aging. Includes implementation and evaluation of therapeutic techniques for promoting health of the older population in a variety of settings. *Preq:* Developmental psychology; a two-semester sequence in science; or consent of instructor.

440 Leadership in Health Promotion 3(2,3) Exploration of the role of health professionals as a leader and activist. Study of legal, ethical, economic, political, and agent roles. Includes fieldwork. *Preq:* HLTH 340.

450, 650 Applied Health Strategies 3(3,0) Students plan, implement, and evaluate strategies to promote health through individual behaviors. Both positive and negative behaviors are included. Examples of strategies include smoking cessation, weight management, and exercise prescription. *Preq:* HLTH 305.

480 Community Health Promotion 3(2,3) Focus on health-promotion activities for community and population groups with emphasis on assessment, program planning, and evaluation. Includes fieldwork. *Preq:* HLTH 380.

490 Research in Health 3(3,0) Discussion of research in health. Focus on analysis of reported research. Ethical, moral, and legal issues are discussed. *Preq/Coreq:* HLTH 380; statistics requirement.

498, 698 Contemporary Health Problems 3(3,0) Current and emerging health problems in contemporary society with emphasis on risk factors, interactive treatment effects, and prevention. *Preq:* A two-semester sequence in science or consent of instructor.

HISTORY (HIST)

Professors: J. L. Arbena, C. K. Bleser, R. M. Golden, T. J. Kuehn, D. M. McKale, E. E. Moise, D. M. Nicholas, *Head;* D. G. Nieman, D. G. Paz, J. V. Reel, Jr., A. Schaffer, H. L. Suggs; *Associate Professors:* E. D. Carney, P. E. Mack, J. A. Miller, R. L. Saunders, Jr., W. F. Steirer, Jr.; *Assistant Professors:* C. A. Grubb, H. M. Larebo, R. P. Leemhuis, S. G. Marks, R. R. Owens, T. G. Young; *Visiting Assistant Professor:* J. M. Manson

100 Higher Education and Clemson 1(1,0) Introduction to higher education. Its background and development in the western world, emphasizing land-grant institutions and Clemson University in particular.

101, H101 History of the United States 3(3,0) The political, economic, and social development of the American people from the period of discovery to the end of Reconstruction.

102, H102 History of the United States 3(3,0) Political, economic, and social development of the American people from the end of Reconstruction to the present.

172, H172 Western Civilization 3(3,0) Political, economic, and social movements of Western civilization from ancient times to the 17th century.

173, H173 Western Civilization 3(3,0) Political, economic, and social movements of Western civilization from the 17th century to the present.

198 Current History 1(1,0) Examination of the major events and problem areas in the news with emphasis on their historical context and possible long-range significance. May be repeated for a total of 3 credits. Does not count toward the requirements of the major or minor in History.

200 Fort Hill Internship 1(0,1) Provides practical experience in public history museum work and historical preservation. May be repeated for a total of 3 credits. Cannot count toward the major or minor in History. To be taken Pass/Fail only. *Preq:* Consent of department head.

300 History of Colonial America 3(3,0) Development of American institutions and customs in the period before 1776. Considerable emphasis is placed on the imperial relations between Great Britain and her colonies and upon the movement towards and the philosophy of the American Revolution.

301 American Revolution and the New Nation 3(3,0) Study of the various historical explanations leading to an understanding of the American Revolution, the establishment of the Nation under the Constitution, and the first decade of the new nation. Special emphasis will be placed upon developing an understanding of individual motivation and ideological development present during the last four decades of the 18th century.

302 Age of Jefferson, Jackson, and Calhoun 3(3,0) Formation and growing pains of the new nation through the Federal and Middle periods of its history, with emphasis on

economic and political development, the westward movement, and the conflicting forces of nationalism and sectionalism.

303 Civil War and Reconstruction 3(3,0) Study of the political, military, and social aspects of the sectional conflict and of the era of Reconstruction. Some emphasis will be placed on the historical controversies which the period has inspired.

304 Industrialism and the Progressive Era 3(3,0) Study of American society in the period between the 1880s and 1930s. This course emphasizes the effects of industrialization and urbanization on the American people.

305 The United States in the Age of the World Wars 3(3,0) An examination of the changes in the American experiences through two world wars, a depression, the Prohibition era and the assumption of international responsibilities.

307 Recent America 3(3,0) Examination of the American experience from the end of World War II through the period of the Korean and Vietnam wars, the Cold War, the Civil Rights movement, the counter-culture of the 1960's, assassinations and Watergate.

311 African Americans to 1877 3(3,0) Study of the African-American experience in the United States, from the African past through slavery to 1877.

312 African American History from 1877 to Present 3(3,0) Study of African American experience in the United States, from 1877 to the present.

313, H313 History of South Carolina 3(3,0) Political, economic, and social development of South Carolina from 1670 to the present.

314 History of the South 3(3,0) Origins and development of political, economic, and cultural institutions of the South from the Colonial period to the present, and the role of the South in the nation's development.

316 American Social History 3(3,0) Study of American society, including the relationship among classes, ethnic groups, regions, and sexes, from the Colonial period to the present.

318 History of American Women 3(3,0) Survey course of the history of American women emphasizing the changing role of women in American culture and society.

321 History of Science 3(3,0) Survey of the development of science in the Western world, emphasizing the period from the Renaissance to the present.

322 History of Technology 3(3,0) Formerly HIST 309. History of the major developments in Western technology and their relationships to the societies and cultures in which they flourished.

323 History of American Technology 3(3,0) Formerly HIST 310. History of developments in technology and their role in American life with particular emphasis on the American Industrial Revolution and the 20th century.

325 American Economic Development 3(3,0) Formerly HIST 306. Economic development of the United States from Colonial to recent times, emphasizing the institutional development of agriculture, banking, business and labor, and government regulations and policy.

327 American Business History 3(3,0) Survey of the history of American business by using a case-study approach. The focus will be placed upon the effects that policies and institutions have on individual businesses.

328 United States Legal History to 1890 3(3,0) Survey of the American legal system in its historical perspective, from Colonial times to 1890. Emphasis will be placed on the relationship between law and society, the way in which the practice of law changed American society, and the way in which social development affected both the theory and practice of the law.

329 United States Legal History Since 1890 3(3,0) Examination of the social, cultural, intellectual, economic, and political forces that have helped shape the law in the United States since 1890.

330 History of Modern China 3(3,0) Growth and development of Chinese civilization from ancient times to the present. Emphasis in the course is on 20th century China,

particularly since the rise to power of the Communist regime.

333 History of Modern Japan 3(3,0) The origin and development of Japanese civilization with particular emphasis on modern Japan from mid-19th century to the present.

338 African History to 1875 3(3,0) Students will study sub-Saharan Africa in the period from antiquity to European colonial rule by exploring the development of Stone Age cultures; agricultural and pastoral societies; ancient civilizations; political, economic, and social systems; gradual shift of initiative from the interior to the coast; and various slave trades.

339 Modern Africa, 1875 to the Present 3(3,0) Students will study sub-Saharan Africa from 1875 to the present, with the focus placed upon the development and decline of European imperialism, dilemmas of African independence, and ethnic struggles in Southern Africa.

340 Ancient Americans 3(3,0) Introduction to the geography of the Western Hemisphere; origin of human life in the Americas; structure and accomplishments of the major pre-Columbian societies, with an emphasis on the rise and decline of the Classic civilizations; the impact of the European conquest; the formation of a new Ibero-American culture.

341 Modern Mexico 3(3,0) Introduction to the geography of the region, origins, and progress of the Independence movements and political, economic and social developments after 1825; current domestic and international problems.

342 South America Since 1800 3(3,0) Introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems.

351 Ancient Near East 3(3,0) History of the peoples and civilizations of the Near East from the Sumerians to the establishment of Roman power in this region. Geography, mythology, religious and economic currents, as well as the methods and discoveries of archaeology will be included.

354 The Greek World 3(3,0) Study of Greek civilization from its beginning until the time of the Roman conquest, concentrating on the social institutions of the Greek city-states.

355 The Roman World 3(3,0) The rise of Rome to world empire and the international civilization it dominated. Concentration on the nature of the political change from Republic to monarchy with particular emphasis on city life and the causes of its decline.

361 History of England to 1688 3(3,0) The evolution of English political, social, economic, and cultural institutions to the 17th century. (Study Abroad)

363 History of England Since 1688 3(3,0) The evolution of English political, social, economic, and cultural institutions from the 17th century to the present.

365 English Cultural History 3(3,0) Survey of the cultural history of England, from Anglo-Saxon times to the present, focusing on the period after the English Renaissance.

370 Medieval History 3(3,0) Survey of the period from the eclipse of Rome to the advent of the Renaissance, emphasizing human migrations, feudalism, rise of towns, and cultural life.

372 The Renaissance 3(3,0) Examination of the transitional period of European civilization (ca. 1300-1500), with emphasis on institutional, cultural, and intellectual developments.

373 Age of the Protestant Reformation 3(3,0) Evolution of Modern Europe (ca. 1500-1660), as affected by the Reformation, wars of religion and growth of nation-states. The study will include intellectual advances and the beginnings of European expansion overseas.

374 Europe in the Age of Reason 3(3,0) Study of the quest for order and the consolidation of the European state system between 1660 and 1789 with emphasis on the idea of absolutism, the question of French hegemony, and the synthesis of the 18th-century Enlightment.

375 Revolutionary Europe 3(3,0) History of Europe from the outbreak of the French Rev-

olution through the Revolutions of 1848, with emphasis on the conflict between the forces of change and those of conservatism, within the states and in Europe in general.

377 Europe, 1914-1945 3(3,0) Course will focus upon Europe during two major wars and the peacetime adjustments Europeans made, or failed to make, during the twenty-year interim between those wars.

378 Europe Since 1945 3(3,0) Course will focus upon how World War II completed the destruction of European global hegemony, creating a bipolar continent with the west dominated by the United States and the east by Soviet Russia; and how Europe adjusted to this situation.

380 Imperial Germany 3(3,0) German history from the beginning of the German Empire, 1870-71, through World War I. This course emphasizes the influence of militarism, nationalism, anti-Semitism and xenophobia on the German culture and political process.

381 Germany Since 1918 3(3,0) German history from the time of Germany's defeat in World War I, through the Nazi period and World War II. This course culminates with the study of a divided Germany.

384 History of Modern France 3(3,0) French history from the mid-19th century to the present with particular emphasis on France since 1900.

385 History of Imperial Russia 3(3,0) Survey of the formative years of the Russian Empire from the time of accession of Peter the Great to the time of the Russian Revolution. Social, political, diplomatic, and intellectual developments will be given equal treatment in the course.

386 History of the Soviet Union 3(3,0) Soviet history from the revolution to the present. Surveys the creation and subsequent development of the communist political and social system, with attention given to culture and diplomacy.

387 The Russian Revolution 3(3,0) History of one of the most formative series of events of the 20th century. Course follows the crisis of Imperial Russia, its downfall during World War I, and subsequent revolutionary upheaval leading to the formation of the USSR.

390 Modern Military History 3(3,0) Survey of the development of modern warfare, and the influence of technological change on warfare. Particular attention will be given to the major conflicts of the 20th century.

391 Post World War II World 3(3,0) The world in the age of the Cold War, the breakdown of the colonial empires, and racial, religious, ethnic, national, and social tensions. The United States will provide the central core to the class.

393 Sports in the Modern World 3(3,0) An analysis of the global evolution and diffusion of sports in the industrial age, with an emphasis on the linkage of sports structure and performance to the larger social context.

With departmental consent, any 400- or 600-level course in history may be repeated one time for credit. The 400-level courses require students to do historical research and writing.

400, 600 Studies in United States History 3(3,0) Topics and problems in the history of the United States from the Colonial era to the present.

438, 638 Problems in African Historiography and Methodology 3(3,0) Course will concentrate upon major issues in the field of African history with an additional focus being placed upon methodological concerns.

440, 640 Studies in Latin American History 3(3,0) Consideration of selected and varied topics in Latin American history through readings, class discussions, and individual or group projects. Special attention will be given to the use of an inquiry or problem-solving method of historical analysis and to the cultivation of a comparative perspective.

450, 650 Studies in Ancient History 3(3,0) Selected topics in the field of ancient history ranging from pre-Biblical times to the fall of the Roman Empire.

460, H460, 660 Studies in British History 3(3,0) Examination of selected themes, topics, or periods in British history from Anglo-Saxon times to the present.

470, 670 Studies in Early European History 3(3,0) Study of selected topics or themes in European history from the fall of the Roman Empire to the age of industrialization.

471, 671 Studies in Modern European History 3(3,0) Study of selected topics or problems in European history from the end of the Old Regime to the present.

491, H491, 691 Studies in the History of Science and Technology 3(3,0) Selected topics in the development of science and technology, with emphasis on their social, political and economic effects.

492, 692 Studies in Diplomatic History 3(3,0) Selected topics and problems in international conflict and conflict resolution among nations. Concentration will usually be in 20th century history.

493, 693 Studies in Social History 3(3,0) Studies in the ways people have earned their livings and lived their lives, individually and as communities, in the confines of different societies.

494, 694 Studies in Comparative History 3(3,0) Selected topics in comparative history, contrasting and comparing similar historic developments in different nations, geographic areas, or civilizations.

495, 695 Studies in the History of Ideas 3(3,0) Selected topics and themes in the development of ideas that have had an impact on the behavior of individuals and civilizations.

496, 696 Studies in Legal History 3(3,0) Study of selected problems in the development of law and the system of criminal and civil justice.

H497 Senior Honors Research 3(3,0) Research for the preparation of senior honors thesis. *Preq:* Senior standing and successful completion of a 400-level history course and approval of the Department of History.

H498 Senior Honors Thesis 3(3,0) Writing of the senior honors thesis. *Preq:* HIST H497.

499 Independent Study 1-3(1-3,0) Study of selected problems in history under the direction of a faculty member chosen by the student. The student and faculty member develop a course of study designed for the individual student and approved by the head of the department prior to registration.

700 United States Through the Civil War 3(3,0)

710 United States Since 1865 3(3,0)

720 Southern History 3(3,0)

760 British History 3(3,0)

770 Europe to the Eighteenth Century 3(3,0)

775 Europe Since the Eighteenth Century 3(3,0)

790 Historical Area Studies 3(3,0)

800 Seminar in United States History 3(3,0)

830 Seminar in Asian History 3(3,0)

840 Seminar in Latin American History 3(3,0)

860 Seminar in British History 3(3,0)

870 Seminar in European History 3(3,0)

880 Special Topics in History 3(3,0)

881 Historiography 3(3,0)

885 Independent Study 3(3,0)

887 Archival Management: An Introduction 3(3,0)

888 Historical and Textual Editing 3(3,0)

891 Master's Research. Credit to be arranged.

894 Practicum in Historical Editing 3(3,0)

HORTICULTURE (HORT)

Professors: J. A. Brittain, R. G. Halfacre, M. T. Haque, J. W. Kelly, *Head*; A. R. Mazur, B. B. Rhodes, T. Whitwell; *Associate Professors:* D. W. Bradshaw, J. D. Caldwell, D. R. Decoteau, W. B. Miller, W. C. Olien, A. J. Pertuit, Jr., D. F. Wagner; *Assistant Professor:* W. V. Baird

101 Horticulture 3(3,0)F Environmental factors and horticultural practices affecting optimum production of floral, fruit, ornamental, and vegetable crops. Survey of the various areas of horticulture and their importance to society.

202 Selected Topics 1-3(1-3,0) Introduction to developing trends/concepts/technologies in horticulture. May be repeated for a maximum of 3 credits or a maximum of 3 credits in combination with HORT 400, but only if a different topic is covered. *Preq:* Consent of instructor.

208 Landscape Appreciation 3(3,0)S Designed to deepen the student's appreciation of our natural and built environments through a study of landscape elements, styles, and professions. Landscapes ranging in scale from residential to regional are critiqued, and design principles and landscape ethics are discussed.

271 Internship 1-6(0,2-12) Preplanned, practical and supervised work experience designed to give beginning students on-the-job learning opportunities that will support their classroom experience. Students will submit monthly reports and present a departmental intership seminar. Undergraduates may accumulate a maximum of 6 credits for participation in HORT 271 and/or 471. *Preq:* Consent of instructor.

303 Plant Materials 3(2,3)F Woody, ornamental plants and their aesthetic and functional uses in landscape developments. The study covers habit of growth, ultimate size, texture effect, period of bloom, color, and cultural requirements.

304 Annuals and Perennials 3(2,3)S Annual and perennial flowers' aesthetic appeal and functional uses and needs. Color, texture, bloom time, form, size and growth requirements as they relate to designing, planting, and maintaining colorful landscapes. *Preq:* HORT 208, 303, or consent of instructor.

305 Plant Propagation 3(2,3)F All phases of plant propagation from seeds, bulbs, divisions, layers, cuttings, budding, and other types of grafting are comprehensively treated. Timing, manner and material for making cuttings; temperature and media requirements and propagation structures for rooting cuttings of ornamental and fruit trees, shrubs, and indoor plants will be studied.

308 Landscape Design 4(3,3)F Landscape planning of residential and public properties in order to achieve best use and most enjoyment from a given piece of ground. *Preq:* HORT 208, 303, or consent of instructor.

310 Greenhouse Crop Physiology 3(2,3)S Physiology, growth and development of floriculture crops in fully or semi-controlled environments, including manipulation of flowering, chemical and environmental height regulation, fertility in artificial substrates, scheduling, cost analysis, and pest management. *Preq:* AGRON 202, HORT 101, or consent of instructor.

352, 652 Tree Fruit Culture and Physiology 3(2,3)F Fruit bud formation, rest period and water relations of fruit plants, soils, fruit setting; orchard soil management and responses of various fruits to fertilizers; principles of pruning, effect of climatic differences, freezing of tissues and means of avoiding injury; harvesting, transportation, and storage. *Preq:* HORT 101 or consent of instructor.

400 Selected Topics 1-3(1-3,0) Presents an in-depth examination of developing trends/concepts/technologies in horticulture. May be repeated for a maximum of 3 credits or a maximum of 3 credits in combination with HORT 202, but only if a different topic is covered. *Preq:* Junior standing or consent of instructor.

406, 606 Nursery Technology 3(2,3)S Principles and techniques in handling nursery crops. *Preq:* HORT 303, 305.

408 Special Problems in Horticulture 1-3(0,3-9) Independent investigation in horticulture. Emphasis will be placed on organizing a quality proposal, conducting the investigation, and reporting of findings at a professional society meeting and/or in a professional publication. Cumulative maximum of 3 credits. *Preq:* Minimum of 75 hours

completed and consent of instructor.

409 Seminar 1(1,0)S Recent research work on various phases of horticulture, methods of conducting investigations, and preparation of report of investigations.

412, 612 Turfgrass Management 3(2,3)F Studies of warm and cool season turfgrasses in relation to value, use, regional adaptation, establishment, soils, and cultural practices. The influence of environmental, cultural, and genetic factors on turf quality and serviceability. Identification of grass and weed species and discussion of programs for the management of lawns, parks, roadsides, and golf courses. *Preq:* BIOL 103 or equivalent.

415, 615 Foliage Plants for Interior Utilization 3(2,3)F Application of foliage plant requirements for their selection and maintenance in interior environments. Laboratories include plant identification, experiment, and graphic representation. *Preq:* BOT 205, HORT 101 and consent of instructor.

416 Floral Design 2(1,3)F Topics covered include simple arrangements (history, containers, mechanical aids, etc.), arrangements for specific occasions, church arrangements, funeral designs, bride's bouquets, dried arrangements and flower preservation, corsage work, foliage arrangements, bonsai, terrarium, Christmas wreaths, and foliage plant identification. *Preq:* BIOL 103 or equivalent.

433, 633 (AGRON) Integrated Weed Management for Agronomic and Horticultural Crops 3(2,2)S Weed management systems consisting of cultural, chemical, and biological methods will be studied for the major agronomic and horticultural crops of South Carolina with problem-solving methodology and herbicide injury diagnosis. *Preq:* AGRON 407 or equivalent introductory weed science.

455, 655 Small Fruit Crops 3(2,3)F Indepth survey of taxonomical, morphological, and physiological characteristics of small fruit crops as they relate to the study of horticultural charcteristics, culture, production, harvesting, and handling of both commercial and home-grown grapes, blueberries, strawberries, brambles, and kiwifruit. *Preq:* HORT 101 or consent of instructor.

456, 656 Vegetable Crops 4(3,3)F Principles and practices employed in the commercial growing and marketing of vegetable crops with emphasis on plant characteristics, cultivars, management practices, harvest, quality factors and grading, storage, economic importance, and areas of production.

461, H461, 661 Problems in Landscape Design 4(3,3)S Landscape planning for larger residential properties, schools, industrial plants, real estate developments; detailed finished plans; further study of materials used; original problems; field study. *Preq:* HORT 308, 407, or consent of instructor.

462, 662 Landscape Design Implementation 3(2,3)F Implementation of landscape plans, including interpretation of specifications, bidding, planting methods, construction materials and installation methods, irrigation, lighting, and allied landscape specialties. In addition maintenance contracts, equipment, methods, materials, and labor management are studied. *Preq:* HORT 308.

464, 664 Postharvest Horticulture 3(2,2)F Study of the biological aspects of methods and practices relating to the harvesting, handling, transportation, and storage of horticultural commodities for fresh market. Topics include an introduction to postharvest physiology, concept of quality and its measurement, standard and innovative postharvest treatments, grades and standards, and various storage methods.

470, 670 Horticulture and Human Well-Being 3(2,3)S The role of horticulture in human well-being (physical and mental) will be emphasized. Adaptive horticultural techniques and activities suitable for individuals with special needs (impaired, disabled, handicapped) will be presented. Students will plan, perform, and report on supervised and independent horticultural activities with selected special individuals or groups.

471, 671 Advanced Internship 1-6(0,2-12) Preplanned work experience under competent supervision in approved agency dealing with horticultural endeavors. Designed to give advanced students on-the-job learning opportunities to apply acquired knowledge and skills. Monthly reports and final departmental seminar required. Undergraduates may accumulate a maximum of 6 credits for participation in HORT 271 and/or 471. *Preq:* Junior standing and consent of instructor.

701 Horticulture: Plant and Environmental Science 3(2,3)

800 Topics in Horticultural Science 1(1,0)

802 Research Systems in Horticulture 3(2,3)

804 Scientific Advances in Ornamental Horticulture 3(3,0)

806 Postharvest Physiology and Handling of Horticultural Crops 3(3,0)

809 Seminar I 1(1,0)

810 Seminar II 1(1,0)

812 Special Topics in Horticulture 1-4(1-4,0)

813 Photomorphogenesis 3(2,2)

814 Environmental Plant Stress Physiology 3(2,2)

891 Master's Research. Credit to be arranged.

921 (BOT) Plant Physiology Colloquium 1(1,0)

991 Doctoral Research. Credit to be arranged.

HOSPITAL AND HEALTH SERVICES ADMINISTRATION (H ADM)

408, 608 Hospital and Health Services Administration 3(3,0) Survey of how hospital and health-care administration is practiced within the United States. Topics include planning; social, legal, and political considerations; alternate forms of organization; management practices; control systems; and trends/issues facing the future of health-care administrators. *Preq:* Senior or graduate-level standing or consent of instructor.

410, 610 Hospital Internship 3(0,9) The student will spend nine hours per week on a specified program of observing, practicing and experiencing the duties of hospital administrators in selected local hospitals. The course will be specifically outlined along with the amount of time the student will spend in each phase or department of the hospital. Student progress will be constantly monitored by University faculty and hospital staff. *Preq:* H ADM 408.

HUMAN RESOURCE DEVELOPMENT (H R D)

410, 610 (G C, IN ED) Selected Topics 1-3 (1-3,0) See IN ED 410.

830 Concepts of Human Resource Development 3(3,0)

845 (IN ED) Needs Assessment for Education and Industry 3(3,0)

846 (IN ED) Applied Public Relations 3(3,0)

847 (IN ED) Instructional Systems Design 3(3,0)

849 Evaluation of Training and Development/Human Resource Development Programs 3(3,0)

860 (IN ED) Instructional Materials Development 3(3,0)

870 (IN ED) Consulting for Education and Industry 3(3,0)

897 Applied Research and Development 3(3,0)

HUMANITIES (HUM)

Professors: S. K. Eisiminger, E. A. Freeman; *Associate Professor:* T. W. Russell III; *Assistant Professors:* A. Bennett, A. L. Low

301 Humanities 3(3,0) Introduction to humanistic studies focusing on relationships among disciplines—painting, sculpture, architecture, music, literature, philosophy, and drama—beginning with prehistory and continuing to the Renaissance.

302 Humanities 3(3,0) Introduction to humanistic studies focusing on relationships among disciplines—painting, sculpture, architecture, music, literature, philosophy, and drama—beginning with the 17th century and continuing to the present.

305 Studies in Science, Technology, and the Humanities 3(3,0) Interdisciplinary course that seeks an understanding of science and technology through the perspectives of the

liberal arts. Specific subjects vary with the instructor. May be repeated once for credit.

306 Creative Genius in Western Culture 3(3,0) Investigation of creativity through study of great innovators in art, literature, music and ideas. May be repeated once for credit.

309 Studies in Humanities 3(3,0) Interdisciplinary approach to the humanities. Special subject matter varies according to the instructor and as approved by the head of the English Department. May be repeated once for credit.

INDUSTRIAL EDUCATION (IN ED)

Professors: P. C. Caley, J. P. Crouch, G. G. Lovedahl, A. F. Newton, D. H. Pate, Jr., *Head;* D. G. Tesolowski, W. E. West; *Associate Professors:* B. V. Burkett, Jr., S. T. Ingram, C. H. Isbell, C. D. Schmittou, E. L. Weir; *Assistant Professors:* J. M. Leininger, C. C. Linnell; *Instructor:* N. W. Leininger; *Lecturers:* M. A. Edlein, R. S. Harris, C. D. Jones

101 Introduction to Industrial Education 3(3,0) Examines the philosophy and structure of industrial technology education in the public school system and the philosophy and organization of human resource development in industry. Students are given an orientation to a major in industrial education and an overview of the principles of technology.

102 Woodworking I 2(1,3) Study of wood, its properties and the requisite skills necessary for understanding the use of wood in our technological way of life.

103 Woodworking II 2(1,3) Continuation of IN ED 102 in the study of wood, its properties, skills in machine and tool use with wood, project design, project costs, and finishing processes necessary for teachers of industrial subjects. *Preq:* IN ED 102, 106.

106 Drafting for Industrial Education I 3(1,6) Basic drafting course which deals with sketching, orthographic projection, isometrics, sections, auxiliary views, dimensioning, developments, and intersections.

107 Drafting for Industrial Education II 3(1,6) Continuation of IN ED 106, dealing with drafting in specific fields such as welding, electronics, topography, and computer-aided drafting. Working and detail drawings of machine parts including threaded fasteners, cams and gears, and techniques of inking are studied. A portion of the course is devoted to organizing materials for teaching drafting. *Preq:* INED 101, 106 or equivalent, and consent of instructor.

108 Training Programs in Industry I 3(3,0) Introduction and first-hand experience in industrial training programs. Emphasis placed on observing and participating in actual training situations as well as communications and media usage in industry. *Preq:* IN ED 101.

202 Manufacturing Technology I: Systems 3(1,6) Introduction to management, personnel, and production systems studies through the creation of a corporation. Includes product identification, product research and design, selection of processes, plant design, production systems, and system enhancement. *Preq:* IN ED 101 or consent of instructor.

203 Basic Metal Processes 3(1,6) Material separating, forming and combining practices in the metals industries through the study of basic casting, welding, and sheet-metal techniques.

204 Communications Technology I: Processes and Materials 3(2,3) Topics covered in the course include graphic communications, photography, computer application and use as a visual communication medium, and audio/video production and application.

205 Power Technology I: Production 3(2,2) Study of power in terms of energy sources and the generation of power. Emphasis is placed on the development of insights and understandings of the scientific and operational principles involved in the production and utilization of power. *Preq:* IN ED 101 or consent of instructor.

206 Advanced Drafting and Design 3(1,6) Study of the relationship of designing and engineering, the design process, stylistic periods, design, research, and product development. Various methods of technical illustration are utilized in the course. *Preq:* IN

ED 106 or equivalent.

208 Electricity 3(2,3) Theory and application of DC and AC fundamentals, including instrumentation, power sources, circuit analysis, motors, construction wiring, and electronic principles and components. *Preq:* IN ED 101.

210 Construction Technology I: Materials 3(2,3) Course designed as an introduction to the commonly used building materials and methods of combining them in present day construction. *Preq:* IN ED 101 or consent of instructor.

215 Technical Airbrush Illustration 3(1,6) Course dealing with the technical application of airbrush technique. Methods of depicting objects on paper, photograph retouching, sandblasting glass, and fabric decoration are all dealt with, using a single-action airbrush.

220 Recreational and Avocational Crafts 3(2,3) Provides exploratory experiences in the performance of a variety of arts and crafts activities, and encourages the development of an understanding of the purpose of arts and crafts in the comprehensive recreational program.

240 Machining Practices 3(2,3) Basic practical shop experiences on the lathe, drill press, milling machine, and shaper. Benchwork, measuring tools, theory and demonstrations related to a survey of fundamental machining practices.

310 Methods of Trade Teaching 3(3,0) Designed to give basic instruction to beginning teachers in tradework. Psychological factors of learning, individual differences, methods of teaching industrial subjects, special methods used in teaching skills, grading of students and keeping of proper records and reports. Offered in Summer Sessions only.

312 Motivation and Discipline in Vocational Education 3(3,0) Provides the classroom teacher and prospective teacher with knowledge and skills in the techniques of student discipline and motivation with application to the occupational education settings.

313 Arts and Crafts 3(1,6) Study of the art and craft of designing and making well-designed, useful objects. Emphasis on the development of skill and knowledge in the industrial crafts. Included will be laboratory activity involving work with wood, metal, ceramic, textiles, paper, plastics, and leather materials. *Preq:* IN ED 101.

315 (ED) Integrating Computers into the Classroom 1(0,2) See ED 315.

316 Plastics and Plastic Processes 3(2,3) Introduction to thermoplastic materials, basic processing, fabricating, and finishing operations. Related careers and technological advances will also be studied. *Preq:* IN ED 101 or consent of instructor.

317 Management of Industrial Education Laboratories 3(2,2) Management and operation of unit and multiple-activity laboratories, including laboratory design, selection and procurement of tools and equipment, budgeting management, and coordination of activities in laboratory courses.

320 Machine Woodworking 2(1,3) Basic characteristics of woodcutting, shaping, and finishing operations by use of machinery and auxiliary tools. Includes project work. *Preq:* Junior standing.

325 Industrial Organizations and People 3(3,0) Study of the relationship of training and safety personnel to the kinds of tasks they are asked to perform in industrial situations. Emphasis is on safety knowledge develoment and on techniques which may be used in industrial safety training. *Preq:* IN ED 101 or consent of instructor.

350 Industrial Cooperative Experience I 6(0,18) Full-time work experience program in industry. The course is offered during the summer only. Students are requested to register with the instructor one semester prior to the summer in which they plan to enroll. *Preq:* Vocational-Technical Education option only.

372 Arts and Crafts for the Elementary Child 3(2,3) Provides the elementary and early childhood teacher with an opportunity to develop technological literacy, art/craft skills in a variety of media, and an understanding of their applications to the curriculum in a classroom environment.

402 Directed Teaching 12(0,36) Supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for securing experience in teaching industrial subjects. *Preq:* IN ED 317, 425, and grade-point ratio re-

quired for graduation.

404, 604 Organization of Industrial Training Materials 3(3,0) Study of the identification, selection, and organization of subject matter appropriate for industrial training programs. Emphasis is placed on analysis techniques, session and demonstration planning, written instructional materials development, trainee evaluation, and planning instructional schedules. *Preq:* Senior standing in Human Resource Development option or consent of instructor.

405, 605 Course Organization and Evaluation 3(3,0) Problems, techniques and procedures in the preparation, selection and organization of subject matter for instructional purposes. Methods, techniques, and preparation of materials used in the evaluation of student achievement in industrial education subjects.

407, 607 Architectural Drafting for Industrial Education 3(1,6) Study of the major aspects of architectural drawing, such as plot, floor, and foundation plans; wall sections; and elevations. *Preq:* IN ED 106.

408, 608 Training Programs in Industry II 3(3,0) Basic concepts of supervision, administration, and management of training programs. Emphasis on determining training requirements, planning, directing, and evaluating training programs. *Preq:* IN ED 108, 404.

410, 610 (G C, H R D) Selected Topics 1-3(1-3,0) Subject areas organized according to program needs. Content of the course will be planned cooperatively by the University and the school system or agency requesting the course. Course may be repeated for a maximum of 18 credits, but only if a different topic is covered. *Preq:* Consent of instructor.

412, 612 Communications Technology II: Systems 3(2,2) Continuation of IN ED 204. Includes theory and operation of communications systems: telegraph, telephone, radio, television, satellites, sound/video recorders, lasers, and computers. Instruction on strategies for interpreting this area of technology to industry personnel and public school students is emphasized. *Preq:* IN ED 204.

414, 614 Electronics for Teachers 3(1,6) Principles of electronics as applied in communications and automatic controls involving transistors, integrated circuits, and other electronic devices and materials for the preparation of teachers of industrial arts and vocational-technical electricity and electronics. *Preq:* IN ED 208 or equivalent.

415, 615 Construction Technology II: Practices and Systems 3(2,3) Study of industrial practices and systems affecting man, materials, and equipment associated with construction industries. Activities are directed toward developing a working knowledge of construction technology and a framework for incorporating this instruction into programs in the public and private sectors. *Preq:* IN ED 210 or graduate standing.

418, 618 Manufacturing Technology II: Materials and Processes 3(2,3) Continuation of IN ED 202 with emphasis on materials and processes of manufacturing. Attention is given to specific materials separating, forming, and combining practices and equipment and on the competitive aspects of manufacturing. *Preq:* IN ED 202, graduate standing, or consent of instructor.

420 Instructional Technology 3(3,0) Designed to familiarize students with the various equipment, materials, and techniques associated with the delivery of instruction. Students will design, produce, and present materials to meet specific educational objectives. *Preq:* IN ED 405 or one year of teaching experience.

421 Vocational Cooperative Programs 3(3,0) Study of the developments, objectives and principles of cooperative training programs. Emphasis is on the organization, promotion, and management of programs in vocational education. *Preq:* Consent of instructor.

422, 622 History and Philosophy of Industrial and Vocational Education 3(3,0) Study of industrial and vocational education programs with the intent of developing a sound individual philosophy of industrial and vocational education. General topics covered: history; local, state, and federal legislation; types of vocational-technical programs; professional organizations; manpower utilization, vocational guidance, and training; industry, labor, and school relationships.

424, 624 School Safety 3(3,0) Study of the principles of school safety emphasizing safety analyses, accident prevention, remediation of unsafe conditions, development and use of instructional materials, and school liability. *Preq:* Senior or Graduate standing in Education.

425, 625 Teaching Industrial Subjects 3(3,0) Effective methods and techniques of teaching industrial subjects. Emphasis is given to class organization, preparation of lesson outlines, and audio-visual aids. *Preq:* ED 335.

432, 632 Advanced Woodworking 2(1,3) Advanced consideration of machine methods and developments, materials, quality factors, and evaluation of instructional materials. *Preq:* IN ED 102.

433 Internship in Vocational Technical Education I 6(0,18) Supervised observation and teaching in cooperation with selected area vocational centers, high schools, and technical colleges to provide experience in teaching specified trades and industrial subjects. *Preq:* IN ED 317 and consent of instructor.

434 Internship in Vocational Technical Education II 6(0,18) Continuation of IN ED 433. *Preq:* IN ED 433 and consent of instructor.

435, 635 Advanced Industrial Metalworking Practices 3(2,3) Continuation of IN ED 203, enabling advanced studies in welding, foundry, and structural metals. A portion of the course will be devoted to studying existing metals manufacturing industries and to developing and using curriculum materials for teaching metalworking concepts. Field trips will be taken. *Preq:* IN ED 203.

438, 638 Advanced Machining 3(1,6) Advanced experiences in the set-up, operation and maintenance of machine tools and equipment. Project and product design. Study and reports of recent machining technological developments. *Preq:* IN ED 240.

440, 640 Contemporary Technological Problems 3(3,0) Designed to provide students with an understanding of the problems and contributions of technology. Examples of these relationships will be taken from historical accounts and from analyses of contemporary technological intervention both in industrialized and nonindustrialized countries.

441 Comprehensive Laboratory in Industrial Education 3(1,4) Course designed to develop skill in working in and the management of multiple activity programs as carried out in the industrial arts and prevocational laboratories. Opportunity is provided to develop a management plan for multiple activities in comprehensive laboratories that the student can use during the directed teaching experience. *Preq:* IN ED 101 and a minimum of 4 courses selected from the following: G C 104, IN ED 102, 203, 205, 208, 240.

442, 642 Competency Testing in Vocational Subjects 3(3,0) Study of competency testing in vocational education which includes educational objectives and measurement; construction and use of oral, objective, short answer, matching essay, and performance tests; and treatment of test data for grade assignments and statistical analysis.

443, 643 Vocational Special Needs Education 3(3,0) Theory and practice related to serving special needs populations in vocational education including legislation, classification systems, school and community relations, career clusters and job analyses, IEPs with a vocational focus, assessment, work adjustment, and development and modification of curricula and instruction. *Preq:* Senior standing.

450 Industrial Cooperative Experience II 6(0,18) Continuation of IN ED 350. *Preq:* Vocational/Technical Education option only.

451 Special Projects 3(3,0) The student is assigned a project in accordance with his needs and capabilities. Projects are either experimental, theoretical or developmental and cover subjects not thoroughly covered in other courses. Written project approval required before registering. *Preq:* Consent of instructor.

452, 652 Advanced Projects 1-6 The student gains depth in content by completing a project under the supervision of an instructor in one of the following subject areas: Arts and Crafts, Drawing and Design, Electricity and Electronics, Graphic Arts, Metalworking, Occupational Education, Power, and Woodworking. Written project approval required before registering. *Preq:* Consent of instructor.

460, 660 Career Education 3(3,0) Introduction to the concepts and philosophical basis for career education with emphasis on the applications of career education as an integrating force within the total school curriculum. This course is designed for all students preparing to teach or those seeking to improve their teaching competencies. *Preq:* AG ED 201, ED 100, IN ED 101, or Graduate standing.

464, 664 Still Media Production 3(1,4) Provides the student with the opportunity to apply still-picture media techniques to tasks in both education and industry.

465, 665 Instructional Video Production 3(1,4) Designed to acquaint the student with basic video tape production techniques, which include planning, scripting, taping, and editing. Emphasizes the development of individual skills, and deals with the production of instructional tapes as opposed to "artistic" ones.

468, 668 Power Technology II: Transmission and Control Systems 3(2,3) Continuation of IN ED 205. Provides instruction in transmitting and controlling power for utilization in such areas as manufacturing, communications, construction, and transportation. Introduces concepts of automation and robotics to enable the classroom teacher and industry personnel to gain necessary insights into this important area of technology. *Preq:* IN ED 205.

470, 670 Internal Combustion Engines 3(2,3) Involves study of the internal combustion engine: theory of operation, applications, methods of analyzing performance, and troubleshooting malfunctions. The course is intended as an elective for Industrial Technology Education and Vocational-Technical Education option majors who desire proficiency in this essential area of industrial education. *Preq:* IN ED 205 or consent of instructor.

480, 680 (AG ED, COLED, ED) Educational Applications of Microcomputers 3(3,0) See COLED 480.

482, 682 (AG ED, COLED, ED) Advanced Educational Applications of Microcomputers 3(2,2) See COLED 482.

496, H496, 696 Public Relations 3(3,0) This course emphasizes the techniques and methods of effective public and industrial relations which contribute to understanding and cooperation of labor, business, professional, educational, and industrial groups.

700 (ED) Supervising the Student Teacher in the Public School 2-3(2-3,0)

815 Seminar in Industrial Education 1(1,0)

820 Recent Process Developments 3(3,0)

840 School Shop Design 3(3,0)

845 (H R D) Needs Assessment for Education and Industry 3(3,0)

846 (H R D) Applied Public Relations 3(3,0)

847 (H R D) Instructional Systems Design 3(3,0)

850 Issues in Industrial Technology 1-3(1-3,0)

851 Current Topics in Communication Technology 1-3(3,0)

852 Current Topics in Manufacturing Technology 1-3(1-3,0)

853 Current Topics in Construction Technology 1-3(1-3,0)

854 Current Topics in Power Technology 1-3(1-3,0)

860 (H R D) Instructional Materials Development 3(3,0)

861 Administration and Supervision of Vocational Education 3(3,0)

865 American Industries 3(3,0)

870 (H R D) Consulting for Education and Industry 3(3,0)

889 (AG ED, ED) Research in Education 3(3,0)

894 Project Research 1-6(1-6,0)

895 (G C) Special Problems I 3(3,0)

896 (G C) Special Problems II 3(3,0)

INDUSTRIAL ENGINEERING (I E)

Professors: R. P. Davis, W. J. Kennedy, D. L. Kimbler, M. S. Leonard, *Head;* C. R. Lindenmeyer; *Associate Professor:* J. S. Greenstein; *Assistant Professors:* W. G. Ferrell, Jr., L. K. Gaafar, A. K. Gramopadhye

201 System Design I 3(3,0) Introduction to the design of industrial engineering systems. Design methodologies will be introduced in the context of a design process that includes determining user needs and demands, establishing system functions, specifying system requirements, conceptual design and detailed design. *Preq:* ENGR 180 and PHYS 122. *Coreq:* E G 209 or consent of instructor.

210 Work Methods and Measurement I 3(2,3) Methods engineering and work measurement for cost control and reduction, planning, and scheduling. Graphic system representation techniques, time study, work sampling, standard data development, and predetermined basic motion time data systems are introduced. *Coreq:* MTHSC 302 or consent of instructor.

250 Modeling and Analysis for Industrial Engineers 3(3,0) Model development and problem-solving techniques in applied mathematics from an industrial engineering perspective. *Preq:* MTHSC 206. *Coreq:* MTHSC 302.

306 Manufacturing Processes 3(2,3) The basic structure of modern manufacturing processes and material properties related to manufacturability, with emphasis on metal cutting, metal working, molding, jointing, and finishing. *Preq:* Sophomore engineering standing or consent of instructor.

361 Industrial Quality Control 3(2,3) Comprehensive survey of techniques from applied statistics and probability which are most applicable to modeling and problem solving in industry. Topics include probability and statistical theory review, statistical quality control charts, acceptance sampling, curve fitting, forecasting, and reliability analysis. *Preq:* MTHSC 405 or consent of instructor.

374 Advanced Manufacturing Systems 3(3,0) Study of the state-of-the-art automated manufacturing systems, CAD/CAM, computer-integerated manufacturing, advanced 3-D computer controlled machining systems, adaptive control, group technology, and flexible manufacturing systems. *Preq:* I E 306 or consent of instructor.

380 Methods of Operations Research I 3(3,0) Introduction to the most useful linear operations research models, including linear programming, integer linear programming, transshipment and assignment problems and network flows. *Preq:* I E 250.

381 Methods of Operations Research II 3(3,0) Probabilistic and random process modeling of systems. Topics include probabilistic modeling, Markov processes, queueing systems and modeling, and introduction to discrete system simulation. *Preq:* I E 250 and MTHSC 302.

384, H384 Engineering Economic Analysis 3(3,0) Basic principles and techniques of economic analysis of engineering projects. Consideration of time value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation and measures of cost effectiveness.

401, 601 Work Methods and Measurement II 3(2,3) Predetermined basic motion-time-data analysis of work methods for synthesis of effective work methods and standards development. Methods-Time Measurement (MTM) is presented in detail to permit application proficiency. Standard data development, using a variety of techniques is covered with emphasis on the use of stepwise multiple regression analysis. A design project is required. *Preq:* I E 210 and MTHSC 405 or consent of instructor.

422, 622 Expert Systems 3(3,0) Introduction to the concepts and methodologies associated with expert system development and utilization. Emphasis is placed on providing an industry-oriented perspective, including topics such as language selection, application considerations and implementation. *Preq:* Junior standing in Engineering.

452, 652 Reliability Engineering 3(3,0) Probabilistic approach to assessing system reliability. Methods for analyzing serial, parallel, and complex systems. Reliability life testing and its acceleration are covered. Essential elements of maintainability are identified and related to system availability. *Preq:* MTHSC 206 and 405 or consent of instructor.

460, H460, 660 Quality Improvement Methods 3(3,0) Study of modern quality improvement techniques presented in an integrated, comprehensive context. *Preq:* Senior standing.

461, 661 Quality Engineering 3(3,0) Design aspects of quality and the engineer's role in problems of quality in production systems. *Preq:* I E 361.

465, H465, 665 Facilities Planning and Design 3(3,0) Study of the principles and techniques of plant layout. Economic selection of materials handling equipment and integration of this equipment into the layout plan to provide effective product flow. Quantitative techniques for evaluation of facilities plans. A design project is required. *Preq:* I E 210, 361, 380, 381, 384.

467 System Design II 3(2,3) Provides the student with the challenge of integrating and synthesizing general engineering knowledge into creatively solving real-world, open-ended problems. This includes developing the problem statement, objectives, and criteria; data collection; technical analysis; developing and integrating recommendations; and presenting results. *Preq:* I E 201, 210, 361, 374, 380, 381, 384.

473, 673 Microcomputer Applications in Industrial Engineering 3(2,3) Introduction to microcomputer-processor fundamentals, software and hardware as these relate to process control, robotics, and computer-integrated manufacturing. Applications demonstrated by laboratory projects. *Preq:* I E 306 or consent of instructor.

482, 682 Systems Modeling 3(3,0) Modeling of discrete industrial systems using a digital computer. The purpose, theory, and techniques of system modeling are presented. *Preq:* I E 381 and MTHSC 405 or consent of instructor.

483, 683 Case Studies in Industrial Engineering 3(3,0) Actual industrial case studies will be used to strengthen the student's ability to identify problems, to select a solution procedure, and to recommend an action. *Preq:* Senior standing in Industrial Engineering.

484, 684 (AG E, E S E) Municipal Solid Waste Management 3(3,0) See E S E 484.

485, 685 Industrial Systems Engineering 3(3,0) Modeling and analysis of multistage decision processes, recursive optimization, process and system design and control problems. *Preq:* I E 380 and 381 or consent of instructor.

486, H486, 686 Production Planning and Control 3(3,0) Fundamentals of forecasting demand; scheduling production, and controlling the movement and storage of material associated with production are studied. State-of-the art manufacturing techniques will be discussed. A design project is required. *Preq:* I E 380 or consent of instructor.

487, 687 Industrial Safety 3(3,0) Recognition and prevention of hazards. Recognition and control of hazardous materials. Developing and managing a safety program. Designing inherently safe equipment and workplaces. *Preq:* Junior standing.

488, 688 Human Factors Engineering 3(3,0) Introduction to design for human use. Information about human performance, abilities, and limitations will be surveyed and applied to the design of tools, machines, facilities, tasks and environments for efficient, safe, and comfortable human use. *Preq:* MTHSC 302 or equivalent or consent of instructor.

489, 689 Industrial Ergonomics 3(2,3) Presentation of the theory and practice of ergonomic principles in the industrial setting. Emphasis is placed on the classic ergonomic problems of work place and work space design, manual materials handling, physically demanding jobs, environmental factors, and human error. Emerging areas such as design for disabled workers are addressed. *Preq:* I E 488 or consent of instructor.

491, H491, 691 Selected Topics in Industrial Engineering 1-3(0-3,0-9) Comprehensive study of any timely or special topic in industrial engineering not included in other courses. May be repeated for a total of 6 credits. *Preq:* Consent of instructor.

492, H492, 692 Design Topics in Industrial Engineering 1-3 Comprehensive study of any timely or special design topic in industrial engineering. May be repeated for a total of 6 credits. *Preq:* Consent of instructor.

801 Design and Analysis of Human-Machine Systems 3(3,0)

802 Design of Human-Computer Systems 3(3,0)

803 Engineering Optimization and Applications 3(3,0)

804 Manufacturing Systems Planning and Design 3(3,0)

805 Foundations in Quality Engineering 3(3,0)

807 Discrete Systems Simulation 3(3,0)

808 Continuous Systems Simulation 3(3,0)

811 Human Factors in Quality Control 3(3,0)

860 Dynamic Programming 3(3,0)

861 Nonlinear Programming 3(3,0)

865 Facility Planning and Design 3(3,0)

871 Industrial Testing and Quality 3(3,0)

872 Design for Quality 3(3,0)

873 Computer-Aided Manufacturing 3(2,3)

880 Advanced Methods of Operations Research 3(3,0)

884 Advanced Engineering Economic Analysis 3(3,0)

885 Design and Analysis of Simulation Models 3(3,0)

886 Operations Research in Production Control 3(3,0)

888 Applied Queuing Theory and Markov Processes 3(3,0)

890 Special Problems in Industrial Engineering 1-3(1-3,0)

891 Master's Research. Credit to be arranged.

893 Selected Topics in Industrial Engineering 1-3(1-3,0)

895 Industrial Engineering Research Techniques 1(1,0)

907 Production Systems Simulation 3(2,3)

971 Advanced Quality Engineering Seminar 3(3,0)

991 Doctoral Research. Credit to be arranged.

INTEGRATED PEST MANAGEMENT (I P M)

Professor: J. A. Brittain

401, 601 Principles of Integrated Pest Management 3(2,3) Origins, theory, and practice of integrated pest management. Relationships among crop production and protection practices are explored. Economics of various control strategies are considered. Integrated pest management field projects are studied. Conventional and integrated pest management approaches are compared. Multidisciplinary plant problem analysis is introduced. *Preq:* AGRON 407, ENT 301, PL PA 401, or consent of instructor.

700 Internship in Plant Health 1-5(0,8-40)

704 Seminar 1(1,0)

800 Special Problems in Plant Health 1-3(1-0,3-9)

INTERDISCIPLINARY STUDIES (CA DS)

151 Design Studies I 3(1,6) Introduction to problem-solving methodology for environmental design through studio exercises, projects, and reviews. *Coreq:* CA DS 153, admission to the College of Architecture.

152 Design Studies II 3(1,6) Continuation of CA DS 151. *Preq:* CA DS 151. *Coreq:* CA DS 154.

153 Design Theory I 1(1,0) Introduction to concepts and principles of architecture, visual arts, landscape architecture, urban and regional planning, and construction management. *Coreq:* CA DS 151.

154 Design Theory II 1(1,0) Continuation of CA DS 153. *Coreq:* CA DS 152.

ITALIAN (ITAL)

Assistant Professor: M. A. Maggiari

101 Elementary Italian 4(3,1) Introductory course stressing grammar, pronunciation, oral practice, and reading skills. Attention is given to practical everyday living as well as cultural considerations.

102 Elementary Italian 4(3,1) Continuation of ITAL 101. *Preq:* ITAL 101 or consent of instructor.

201, H201 Intermediate Italian 3(3,0) Brief review of ITAL 101 and 102, with conversation, composition, and dictation, and the beginning of more serious readings of Italian literature in short stories and plays. *Preq:* ITAL 102.

202, H202 Intermediate Italian 3(3,0) Increasingly difficult readings in Italian literature, supplemented with classroom discussions and compositions. *Preq:* ITAL 201.

398 Directed Reading 1-3(1-3,0) Directed study of selected topics in Italian literature, language, and culture. May be repeated for a total of 6 credits. *Preq:* Consent of department head.

JAPANESE (JAPN)

Assistant Professor: T. Kishimoto

101 Elementary Japanese 4(3,1) Course for beginners in which the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. The Japanese writing system will be introduced. Students will learn how to recognize and write the two alphabets HIRAGANA and KATAKANA. Three hours a week of classroom instruction and one hour a week in the language laboratory.

102 Elementary Japanese 4(3,1) Continuation of JAPN 101. Students will study Kanji characters. *Preq:* JAPN 101.

190 Study and Travel Abroad Preparation 1(1,0) Designed to prepare students for study/travel in Japan. Students will be sensitized to cross-cultural differences and will be provided with practical skills and sources of information. Taught mainly in English. To be taken Pass/Fail only. *Preq:* Consent of instructor.

201 Intermediate Japanese 3(3,0) A brief review of JAPN 101 and 102, with conversation, composition and beginning or more serious reading of Japanese in short stories. Students study Kanji characters. *Preq:* JAPN 102.

202 Intermediate Japanese 3(3,0) A brief review of JAPN 201, with conversation, composition, and dictation based on more difficult Japanese reading selections; includes a continuation of Kanji characters. *Preq:* JAPN 201.

305 Japanese Conversation and Composition 3(3,0) Practice in the spoken language with emphasis on vocabulary, Kanji, pronunciation, and comprehension. Learning practical language skills and intercultural communication through various topics. *Preq:* JAPN 202 or consent of department head.

306 Japanese Conversation and Composition 3(3,0) Continuation of JAPN 305. More practice in the spoken language with emphasis on vocabulary, Kanji, pronunciation, and comprehension. Learning practical language skills and intercultural communication through various topics. *Preq:* JAPN 305 or consent of department head.

307 Japanese Civilization I 3(3,0) Study of the significant aspects of the culture of Japan. *Preq:* JAPN 202 or consent of department head.

308 Japanese Civilization II (3,3,0) Study of significant aspects of the culture of Japan. *Preq:* JAPN 202 or consent of department head.

316 Japanese for International Trade I 3(3,0) Spoken and written Japanese common to the Japanese-speaking world of business and industry, with emphasis upon business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analysis of American and Japanese cultural patterns in a business setting. *Preq:* JAPN 306 or consent of department head.

398 Directed Reading 1-3(1-3,0) Directed study of selected topics in Japanese literature, language, and culture. May be repeated for a maximum of 6 credits. *Preq:* Consent of department head.

411 Studies in the Japanese Language I 3(3,0) Advanced training in the spoken and written language with emphasis on formal expressions. *Preq:* JAPN 306 or consent of department head.

412 Studies in the Japanese Language II 3(3,0) In-depth study of Kanji characters. *Preq:* JAPN 411 or consent of department head.

416 Japanese for International Trade II 3(3,0) Study of language and cultural environment of the Japanese-speaking market, including the linguistic and cultural idioms which support global marketing in general, and the international marketing of textiles, agricultural products, and tourism in particular. *Preq:* JAPN 316 or consent of department head.

LANDSCAPE ARCHITECTURE (LARCH)

Associate Professor: L. Tai; *Assistant Professor:* F. F. Chamberlain

262 Landscape Architectural Technology I 3(2,2) Lecture/studio course on the technological aspects of landscape architecture, including design grading and drainage, site information gathering and analysis, horizontal and vertical alignments of walks and roadways, structures of landscape architecture, irrigation design, pools and fountains, and lighting. *Preq:* CA AR 251 and Sophomore standing or consent of program head.

351 Landscape Architecture Design I 6(1,10) Studio work with adjunct demonstrations and lectures concerned with intermediate landscape architectural design problems. *Preq:* CA AR 252, 254.

352 Landscape Architecture Design II 6(1,10) Continuation of LARCH 351. *Preq:* LARCH 351.

362 Landscape Architectural Technology II 3(2,2) Continuation of LARCH 262. *Preq:* LARCH 262.

421 Landscape Architectural Seminar 3(3,0) Lectures and seminars dealing with pertinent topics related to environmental, technological and theoretical issues in landscape architecture, land planning, and urban design. *Preq:* Senior standing or consent of instructor.

451 Landscape Architecture Design III 6(1,10) Studio work with adjunct demonstrations and lectures concerned with advanced landscape architectural design problems. *Preq:* LARCH 352.

452 Landscape Architecture Design IV 6(1,10) Continuation LARCH 451. *Preq:* LARCH 451.

462 Landscape Architectural Technology III 3(2,2) Continuation of LARCH 362. *Preq:* LARCH 362.

490 Directed Studies and Projects in Landscape Architecture 1-5(0,3-15) Comprehension studies and/or research of special topics not covered in other landscape architectural courses. *Preq:* Junior standing and consent of department head.

552 Professional Landscape Architectural Design 6(0,14) Complex problem-solving projects involving regional design analysis and planning, city planning and urban design, complex building relationships, and intense site utilization and design. May be repeated for a maximum of 12 credits.

562 Landscape Architectural Technology IV 2(0,4) Studio course for the integration of design and technology. *Preq:* LARCH 462, professional standing. *Coreq:* LARCH 552.

581 Landscape Architectural Professional Practice 3(3,0) Lecture course dealing with general consideration of landscape architectural office procedures. Study of the professional relationships of the landscape architects to client and contractor including problems of ethics, law, and business. *Preq:* Professional standing or consent of instructor.

LANGUAGE (LANG)

191 Working/Internships Abroad Survey 1(1,0) Survey designed to familiarize students going abroad for work/internships with various international work environments. To be taken Pass/Fail only. *Preq:* Consent of instructor.

LANGUAGE AND INTERNATIONAL TRADE (L&IT)

Associate Professors: E. P. Arnold, J. C. Bednar, J. I. Suarez, *Director; Assistant Professor:* T. Kishimoto; *Visiting Instructor:* M. Pichot

127 Introduction to Language and International Trade 1(1,0) Survey of the nature of international trade and related career opportunities. Information and applications of specific relevance to tourism, agriculture, forest products, and textile industries will be offered. To be taken Pass/Fail only.

400 Language and International Trade Internship 1-3 A one-semester, full-time (or equivalent part-time) work assignment which provides the opportunity for the student to extend theoretical classroom learning through work experience in an appropriate setting. A final report is required. May be repeated for a total of 6 credits. To be taken Pass/Fail only. *Preq:* FR 316, GER 316, or SPAN 316 and 12 semester hours in a Language and International Trade technical option.

401 Language and International Trade Practicum 1-3 Foreign language experience such as an approved study abroad program which provides the student with the opportunity to apply theoretical classroom learning to a foreign language experience in an appropriate setting. To be taken Pass/Fail only. *Preq:* FR 316 or GER 316 or SPAN 316 and 6 credits in language.

402 Language and International Trade Directed Study 3 Directed study of an individual project in language and international trade. To be taken Pass/Fail only.

LATIN (LATIN)

Professor: R. R. McGregor, Jr.

101 Elementary Latin 4(4,0) Course for beginners designed principally to teach the reading of the language.

102 Elementary Latin 4(4,0) Continuation of LATIN 101.

201 Intermediate Latin 3(3,0) Review of the fundamental principles of grammar in conjunction with readings from the Classical period. *Preq:* LATIN 102 or equivalent.

202 Intermediate Latin 3(3,0) Continuation of LATIN 201 with the introduction of writings from the late Latin and Medieval periods. *Preq:* LATIN 201 or equivalent.

398 Directed Reading 1-3(1-3,0) Directed study of selected works in Latin. May be repeated for a total of 6 credits. *Preq:* LATIN 202 or equivalent and consent of department head.

LEGAL STUDIES (LAW)

Professors: A. H. Ringleb, T. B. Yandle; *Associate Professors:* D. J. Boudreaux, J. K Cheezem, F. L. Edwards; *Assistant Professor:* E. O'Hara; *Adjunct Professors:* R. L. Miller, C. R. Stewart, M. L. Thompson, L. J. Spooner

312 Commercial Law 3(3,0) Introduction to business law with primary attention given to contracts, agency, and negotiable instruments. *Preq:* Junior standing.

313 Commercial Law 3(3,0) Continuation of LAW 312 with emphasis on business organizations, personal and real property, estates and bankruptcy, sales and secured transactions. *Preq:* LAW 312 or consent of instructor.

322 Legal Environment of Business 3(3,0) Examination of both state and national regulation of business. Attention is given to the constitution and limitations of power, specific areas in which governments have acted, and the regulations that have been imposed in these areas. *Preq:* Junior standing.

333 Real Estate Law 3(3,0) The nature of real property and means of acquiring rights therein: conveyance of ownership, creation and execution of deeds, mortgages, etc.,

landlord and tenant relationships, shared concepts, and government regulation.

401 Labor Law 3(3,0) Basic labor law in the National Labor Relations Act, the Taft-Hartley and Landrum-Griffin Acts. Legal problems raised by state and federal statutes such as Workmen's Compensation, Wage and Hour Legislation, and Equal Opportunity laws. *Preq:* LAW 322, Junior standing.

402 (ECON) Law and Economics 3(3,0) Application of economics to the law of property, torts, and contracts; regulation of markets, business organizations and financial transactions; and the distribution of income and wealth. *Preq:* ECON 211 and LAW 312 or consent of instructor.

405, 605 Construction Law 3(3,0) Provides a practical knowledge of legal principles applied to the construction process and legal problems likely to be encountered by the practicing construction professional. Topics include construction contracting, liability, claims and warranties, documentation, and responsibility and authority of contracting parties. *Preq:* LAW 312 or 322 or consent of instructor.

429, 629 Environmental Law and Policy 3(3,0) Review of legal issues involving environmental law and policy. Course covers the law regarding water, land, and air pollution, and other special laws such as Superfund and RCRA. The consequences of existing and alternative rules for environmental protection are subject to economic analysis. *Preq:* ECON 314 or 409 and LAW 312 or 322, or consent of instructor.

LEISURE SKILLS (L S)

Professors: G. E. Howard, J. R. Pope, Jr.; *Assistant Professor:* M. H. Wynn; *Lecturer:* B. W. Stevens

101 Challenge Recreation Activities 1(1,0) Course designed to encourage students to broaden their leisure skills and improve their self-images through challenge activities. Classroom instruction will stress how to get started safely in flying, scuba, canoeing, skiing, windsurfing, mountaineering, hang-gliding, ballooning, and other challenge activities.

110 Bowling 1(0,3) Basic instructional program on techniques of bowling.

130 Alpine Skiing 1(0,45) Basic downhill snow skiing instruction including equipment selection, safety, and maintenance; parallel turns; edging; carved and linked turns; wedeling; and safety and etiquette. There is an additional fee for this course. Taught during Christmas recess. (Contact the Department of Parks, Recreation, and Tourism Management in October.)

140 Fencing 1(0,3) Individual and group instruction for beginners in the basic skills and techniques of foil fencing.

150 Beginning Swimming 1(0,3) Fundamentals of swimming and water safety.

151 Aquatic Sports and Diving 1(0,3) This course is designed to acquaint the student with various forms of aquatic sports; competitive swimming, diving and water polo.

152 Sailing 1(0,3) Basic instruction in the nomenclature, safety and rescue techniques, and skills required to skipper sailing craft. *Preq:* Basic swimming skills.

153 Beginning Canoeing 1(0,3) Basic instruction in the nomenclature, strokes, and safety techniques in canoeing. *Preq:* Basic swimming skills.

154 Windsurfing 1(0,3) Basic windsurfing instruction including rigging, launching, tacking, jibbing, rig and foot steering, safety, maintenance, equipment selection, rules-of-the-road, and racing techniques are covered. Offered Fall Break and First Summer Session. There is an extra fee for this course. *Preq:* Ability to swim 300 yards and tread water for 5 minutes.

160 Beginning Tennis 1(0,3) Fundamentals course stressing rules, strokes and strategy, with ample opportunity for practice.

162 Handball 1(0,3) Thorough knowledge and understanding of the rules, strategy, fundamental skills, and techniques of handball for the beginning player.

163 Racquetball 1(0,3) Basic skills, knowledge of rules, and strategy, and basic strokes.

170 Beginning Golf 1(0,3) Fundamental course stressing rules, strategy, and basic

strokes.

190 Modern Dance 1(0,3) Introduction to modern dance techniques with emphasis on developing the style of movement and understanding the dance art form.

201 Sports Officiating 1(0,3) Practical study of officiating for various sports. The course will include studies and practical application of officiating rules and mechanics. Sports that will be studied include football, basketball, softball, soccer, and introductions to a variety of other team sports.

230 Advanced Alpine Skiing 1(0,45) Advanced downhill snow skiing instruction in such techniques as mogul skiing, check turns, free-style and racing. There is an additional fee for this course. Taught during Christmas recess. (Contact the Department of Parks, Recreation, and Tourism Management in October.) *Preq:* L S 130 or consent of instructor.

254 Advanced Lifesaving 1(0,3) Course designed to enhance aquatic skills and to develop lifesaving techniques. It teaches progressive techniques and practice of lifesaving and water safety skills. *Preq:* Pass preliminary swim test.

255 Water Safety Instruction 1(1,0) Course teaches progressive techniques and practice of teaching swimming and lifesaving. *Preq:* L S 254.

260 Intermediate-Advanced Tennis 1(0,3) Opportunity to advance and correct mistakes in basic tennis skills. *Preq:* Basic tennis skills.

263 Intermediate Racquetball 1(0,3) Course stressing advanced skills, techniques, and strategy with ample opportunity for practice and competition. Conditioning drills and safety aspects will also be covered. *Preq:* L S 163 or consent of instructor.

MANAGEMENT (MGT)

Professors: J. K. Butler, Jr., R. S. Cantrell, M. D. Crino, J. S. Davis, D. W. Grigsby, W. H. Hendrix, *Head;* J. J. Kanet, R. L. LaForge, T. L. Leap, M. A. McKnew; *Associate Professors:* R. L. Clarke, J. W. Patterson, C. H. St. John, U. V. Sridharan, T. P. Summers, D. M. Swanson; *Assistant Professors:* L. D. Fredenall, A. Lipp, J. L. Miller, T. L. Robbins, P. L. Roth, H. Soroush, A. D. Wheeler; *Instructors:* J. H. Abraham, M. J. Duke, C. S. Ellis; *Visiting Professor:* J. O. Fiet; *Visiting Lecturers:* T. G. Christoph, H. P. Coston, B. J. Foltz, J. S. Holcombe, T. B. Honeycutt, T. J. Krupka, C. L. Lyons, J. F. Mason, E. J. Nagele, J. Spano, M. H. Williams, R. G. Young

105 Current Topics in Industrial Safety Management 1(1,0) Discussion of current events related to safety and health and the rights and responsibilities of employees, employers, and the public. Topics will include right-to-know legislation, product liability, risk and insurance, nuclear power, drug use in the workplace and other recent issues.

200 Introduction to Business 3(3,0) The role of business in our society will be critically examined. The student will be exposed to a broad overview of the functions of a business. Enrollment for credit not allowed for students majoring in Accounting, Management, Financial Management, Industrial Management, or Marketing.

299 Computer Utilization 1(1,0) Familiarization in the use of modern timesharing computer terminals and minicomputers. *Preq:* CP SC 120 or equivalent. *Coreq:* MA SC 310 or consent of instructor.

301, H301 Principles of Management 3(3,0) Management's role as a factor of economic production. Functions of management, principles of organization, and behavior in organizations.

302 Principles of Industrial Safety Management 3(3,0) Fundamentals of industrial safety management, including loss prevention, industrial hygiene, and fire protection. This course serves as a good single course overview of the field and also is an excellent introduction to further courses in this area.

305 Economics of Transportation 3(3,0) Formerly MGT 405. Topics covered include history and structure of transportation systems in the United States, the nature of transportation costs and rates, transportation systems as factors in industrial location, transportation policy and transportation's role in national security. *Preq:* Junior or Senior standing.

307, H307 Personnel Management 3(3,0) Principles, concepts, and techniques concerned with effective and efficient utilization of personnel. Emphasis on motivation, leadership, and human behavior as they relate to employer-employee relations. Topics include personnel recruitment, classification, selection, training, development, and performance evaluation. *Preq:* Junior standing.

308 Fundamentals of Industrial Hygiene 3(3,0) Study of effects of chemical, biological, physical, and ergonomic workplace hazards on human health. Included are fundamental concepts of toxicology, industrial hygiene, and risk assessment, as well as discussions of regulatory issues and current case studies.

317 Logistics Management 3(3,0) Formerly MGT 417. Management of physical distribution and supply systems with emphasis on design concepts, cost determinants and control. *Preq:* Junior or Senior standing.

320 Accident Prevention and Loss Control 3(3,0) Philosophies and techniques of accident prevention and loss control, including risk assessment, hazard analysis, accident investigation, and methods to control and correct loss-producing conditions; also application of these techniques to current technologies.

322 Industrial Hazard Recognition and Control 3(3,0) Application of basic physical principles to the understanding, recognition, and control of mechanical, electrical, thermal, and nuclear hazards in the industrial setting.

390 Operations Management 3(3,0) Examines the role of operations management in both manufacturing and service organizations. Discusses the concepts, tools, and techniques for managing the operations function. Topics include operations strategy, design, planning and control. *Preq:* MGT 301 and MTHSC 301 or equivalent.

399, H399 Management Applications of Microcomputers 2(1,3) Three aspects of microcomputer applications are addressed: (1) analysis of the business potential of microcomputer applications, (2) use of microcomputers to reinforce material from other management courses, and (3) the microcomputer as a personal/professional support device. *Preq:* ACCT 201, MTHSC 301 or consent of instructor.

400 Management of Organizational Behavior 3(3,0) Purpose of this course is to provide the management student with a framework for understanding how behavior within business organizations is managed. Particular emphasis will be placed on integrating management theory with recent developments in the behavioral sciences with distinct management applications. Theory, research, and business applications will be considered. *Preq:* MGT 301 or 307.

401 Fire Protection and Prevention 3(3,0) Fundamental course to increase awareness of the causes of uncontrolled fires and explosions. The associated dangers to life, property, and industrial/commercial productivity are stressed, along with techniques available for their protection (education, detection, supression).

402, H402, 602 Operations Planning and Control 3(3,0) Managing, planning, and controlling production and service operations with emphasis on demand forecasting, aggregate planning, production scheduling and inventory management. *Preq:* MGT 390; MA SC 310; and 312 or 413.

403 Special Problems 1-3(1-3,0) Planning, developing, and executing a research project related to the field of management or defense studies. *Preq:* Senior standing in Industrial Management or Management and consent of instructor.

404 Advanced Statistical Quality Control 3(3,0) Statistical quality control techniques as applied to all areas of quality control: process control, process capability, acceptance sampling, and economic aspects of quality decisions. *Preq:* MA SC 310 and MGT 390.

406, 606 Location Economics 3(3,0) Theoretical study of the general factors which determine industrial location in a market place economy. Current literature is surveyed. A comparison of location theory and actual location patterns is stressed. *Preq:* Senior standing or consent of instructor.

407 Directed Research 1(1,0) Planning, developing, and executing a research project related to the field of management. *Preq:* Senior standing in Management or Industrial Management.

408, 608 Design of Production Systems 3(3,0) Managing, planning, and controlling pro-

duction and service operations with emphasis on design of production systems, work measurement and standards, maintaining effective operations, project management and quality control. *Preq:* MA SC 310 and 312 or 413, MGT 390.

409, 609 (ECON) Managerial Economics 3(3,0) See ECON 409.

410 Safety in Building Construction 3(3,0) Fundamentals of accident prevention and the Occupational Safety and Health Act as applied to the construction industry. Management-oriented program that establishes safety as a cornerstone of profitability and efficiency in a complex industry.

415, H415, 615 Business Strategy 3(3,0) Capstone course for seniors. Various methods are used in analyzing complex business problems, requiring students to integrate their knowledge of all areas of business. Student participation and written and oral communications are stressed. *Preq:* ACCT 202; ECON 211, 212; FIN 306 or 312; MGT 301; MKT 301 and Senior standing.

416, 616 Management of Human Resources 3(3,0) Recent developments in the management of human resources with emphasis on results of research into the motivation, development of potential, and full utilization of the human resources. *Preq:* MGT 307 or consent of instructor.

418, 618 Management Information Systems 3(3,0) Use of data processing concepts as an aid in implementing managerial functions. Electronic data processing terminology, software, hardware, computer operations and techniques, systems analysis and the principles of management information systems design and implementation are emphasized. *Preq:* CP SC 120 or equivalent.

419 Industry and the Environment 3(3,0) Discussion of current issues and policies involving the impact of industry on the environment and effects of current environmental regulations and attitudes on industrial operations. Included are topics in environmental management, pollution and control, hazardous waste, and environmental liability.

420, 620 Defense Management 3(3,0) Examines components and budget classifications as well as organization and management systems employed in the Department of Defense. *Preq:* ECON 419 or consent of instructor.

422 Small Business Management 3(3,0) Study of the management of the small independently owned and operated business. Emphasis will be placed upon analyzing new business opportunities, planning and establishing a growing concern, and managing the contemporary small business. Field experience in consulting with small businesses will enhance the student's understanding of the unique opportunities and problems of small business organizations. *Preq:* ACCT 201, MGT 301, MKT 301.

423, 623 International Business Management 3(3,0) Survey of the theoretical and institutional complexities of international business operations. Topics include exporting, importing, foreign investment, multinational corporations, and the international payment system. *Preq:* Senior standing.

424, 624 International Transportation and Logistics 3(3,0) Examination and analysis of international transportation systems and their logistics support systems. Topics include ocean shipping, international air transportation, port management and EEC and Soviet-block transport systems. International transport legislation and policies are also analyzed. *Preq:* Senior standing or consent of instructor.

425, 625 Compensation Management 3(3,0) Examination of the compensation employees seek in exchange for their efforts and contributions. Topics include government and union influences; job content analysis, description, and evaluation; developing pay structures; measuring and paying for performance; employee benefits; adminstration of the compensation plan; executive, managerial, professional, and sales.

426 Industrial Traffic Management 3(3,0) Course surveys the responsibilities and functions of industrial traffic management in manufacturing and distribution. Emphasis is on the role of the industrial traffic manager in optimizing the logistics system of the firm; i.e., the materials management of its inbound supplies and the distribution of its finished products. *Preq:* MGT 305 or 317.

430 Senior Seminar in Management 3(3,0) Involves an indepth study of current busi-

ness topics and allows the senior management student the opportunity to relate their academic studies to real-world problems. A senior paper will be required. *Preq:* Senior standing.

490 Selected Topics in Industrial Management 3(3,0) In-depth examination of advanced topics in Industrial Management. Topics may vary in keeping with developments in the management profession and interests of faculty. Emphasis will be on the application of these topics to the production and operations management environment. *Preq:* MGT 402 or 404 or 408.

800 Management Gaming 1(0,3)

801 Production and Pricing Analysis 3(3,0)

803 Operations Management 3(3,0)

804 Managerial Policy 3(3,0)

805 Advanced Quality Control 3(3,0)

807 Comparative Management Theory 3(3,0)

808 Manufacturing Planning and Control Systems 3(3,0)

809 (M B A) Organization Theory and Behavior 3(3,0)

812 Business Logistics Management 3(3,0)

813 Business Research 3(3,0)

815 Personnel Management 3(3,0)

817 Information Systems Design and Implementation 3(3,0)

818 Management Support Systems 3(3,0)

891 Master's Research. Credit to be arranged.

903 Research Issues in Material Requirements Planning 3(3,0)

904 Seminar in Current Management Topics 3(3,0)

905 Research Methods 3(3,0)

910 Seminar in Operations Management 1-3(1-3,0)

911 Seminar in Decision Theory 1-3(1-3,0)

913 Management Systems Analysis 3(3,0)

915 Seminar in Business-Level Strategy Formulation and Implementation 3(3,0)

916 Directed Readings in Management 1-3(1-3,0)

918 Seminar in Management Support Systems 3(3,0)

921 Seminar in the Science and Practice of Business and Economic Modeling 3(3,0)

950 Seminar in Corporate-Level Strategy Formulation and Implementation 3(3,0)

952 Seminar in Manufacturing and Operations Strategy 3(3,0)

991 Doctoral Research. Credit to be arranged.

MANAGEMENT SCIENCE (MA SC)

Professors: R. S. Cantrell, M. A. McKnew; *Associate Professor:* J. W. Patterson; *Instructor:* C. S. Ellis

310, H310 Introduction to Management Science 3(3,0) Quantitative methods of the management scientist with applications to business and industrial problems. Topics include regression analysis, correlation analysis, analysis of variance, sampling, and nonparametric methods. *Preq:* MTHSC 301. *Coreq:* MGT 299 or consent of instructor.

312, H312 Decision Models for Management 3(3,0) Exploration of the ways in which management science decision models can help in making sound managerial decisions. Topics include decision models and decision making, deterministic modeling, probabilistic modeling, and simulation. May not be taken by students who have passed MA SC 413.

413 Management Science I 3(3,0) Role and use of management science techniques in decision making in business and industry. Stochastic and deterministic models will be emphasized. Topics include linear programming, queuing, Markov chains, and simulation. May not be taken by students who have passed MA SC 312. *Preq:* Consent of instructor.

414 Statistical Analysis 3(3,0) Application of statistics in management decision making. Emphasis is placed on the proper design, analysis and interpretation of planned experiments. Topics include single factor through fractional factorial experiments. *Preq:* MTHSC 301 or equivalent.

806 Regional Science Methods 3(3,0)

807 (ECON) Econometric Methods I 3(3,0)

808 (ECON) Econometric Methods II 3(3,0)

810 Foundations of Management Science 3(3,0)

812 Management Science II 3(3,0)

814 Design of Experiments in Business and Management 3(3,0)

MARKETING (MKT)

Professors: N. Kangun, *Head;* R. M. Reese, G. L. Waddle; *Associate Professors:* L. Carlson, R. Gomes, S. J. Grove, M. C. LaForge; *Assistant Professors:* C. R. Duke, P. A. Knowles, D. A. McBane, J. A. Muncy, G. M. Pickett; *Visiting Associate Professor:* L. H. Stone; *Visiting Instructor:* J. G. Gaubert

301 Principles of Marketing 3(3,0) Principles and concepts involved in planning, pricing, promoting, and distributing of goods and services. *Preq:* Minimum of 45 hours completed or consent of instructor.

302 Consumer Behavior 3(3,0) Examination of selected individual and group behavioral science concepts and their application to the understanding of consumer decision making. *Preq:* MKT 301.

420 Professional Selling 3(3,0) Examination of the theory and practice of selling of industrial and consumer goods and services. Text, cases, and practical application. *Preq:* MKT 301 or consent of instructor.

422 Marketing for Small Business 3(3,0) Translation of the theories of marketing into practical ideas and techniques that promote successful marketing practices in small business. *Preq:* MKT 301.

423 Promotional Strategy 3(3,0) Emphasis on promotion as the communication function of marketing. Attention given to communication theory and promotion's relation to mass and interpersonal communication. Factors affecting the promotional decision-making process are explored, and promotion as a competitive tool is examined. *Preq:* MKT 301.

424 Sales Management 3(3,0) A comprehensive examination of the planning, implementation, and control of professional sales organizations. *Preq:* MKT 301.

425 Retail Management 3(3,0) Retailing is studied from a decision-making approach. Topics covered include target market analysis, location analysis merchandising, human resources, pricing, and promotion. *Preq:* ACCT 202 and MKT 301; or consent of instructor.

426 Business Marketing 3(3,0) Study and analysis of the problems and approaches to the marketing of goods and services to commercial enterprises, governments, and nonprofit organizations. Emphasis is placed upon developing strategic responses to market opportunities given competitive behavior. *Preq:* MKT 301.

427, 627 International Marketing 3(3,0) Study of marketing from the international point of view. Emphasis will be placed upon the necessary modification of marketing thinking and practice for foreign markets due to individual environmental differences. *Preq:* MKT 301.

428 Services Marketing 3(3,0) Exploration and study of the nature of service organizations and the principles which guide the marketing of their products. Emphasis will

be placed upon a marketing mix that is fundamentally different than that found in traditional goods marketing. *Preq:* MKT 301 or consent of instructor.

429, 629 Public and Nonprofit Marketing 3(3,0) Examines the role and application of marketing in public and nonprofit settings. Focuses on a conceptual understanding of the marketing discipline and marketing processes and shows how basic concepts and principles of marketing are applicable to public and nonprofit organizations. *Preq:* MKT 301 or consent of instructor.

430, 630 Marketing Product Management 3(3,0) Management of the firm's product or service offerings. Topics include new product screening, evaluation and development; product line and mix analysis, abandonment decisions, brand manager's role, new product development department, and other. Emphasis on decision making. *Preq:* MKT 301 and MA SC 310; or consent of instructor.

431, 631 Marketing Research 3(3,0) Research used in marketing decision making. Primary emphasis on methods and techniques used in planning, collection, processing and utilization of information. Topics include research design, sources of information, questionnaire design, sampling, data collection and data analysis. *Preq:* MKT 301, MTHSC 301, and MA SC 310; or consent of instructor.

432, 632 Quantitative Marketing Analysis 3(3,0) Practical application of advanced data analysis techniques. Topics include advanced regression, factor analysis, multidimensional scaling, cluster analysis, conjoint analysis, game theory, mathematical programming, and simulation models. *Preq:* MKT 431 and MTHSC 203 or 301; or consent of instructor.

437, 637 Global Marketing Strategies 3(3,0) Investigation of the importance of marketing strategy planning for the global marketer. Relevant and complex factors which vary in different global environments will be identified and analyzed. *Preq:* MKT 427.

438, 638 Technical Marketing 3(3,0) Integration of theories and research from business marketing, personal selling, and product management as applied to the marketing of advanced technology products and services. Original investigation of assigned projects, and indepth case studies will be emphasized. *Preq:* MKT 301, 426, and 3 additional hours of marketing courses; or consent of instructor.

450 Marketing Management 3(3,0) Application of marketing constructs in the analysis and solution of marketing problems. Emphasis is placed on information systems, data analysis, and critical-thinking skills in solving marketing problems in a wide range of managerial decision areas including, but not limited to, new product development, pricing, advertising, personal selling, channels and international marketing. *Preq:* MKT 301 and 6 hours of 400-level marketing courses, or consent of instructor.

495, 695 Selected Topics 3(3,0) In-depth examination of timely topics in marketing. May be repeated for credit as topics vary. *Preq:* MKT 301 or consent of instructor.

499 Independent Study 1-3(1-3,0) Directed readings or independent research in selected marketing areas. Topics must be selected and proposed by student. Proposals must be approved by instructor. May be repeated for a maximum of 3 credits. *Preq:* MKT 301, 302 and consent of instructor.

MATERIALS ENGINEERING (MAT E)

Professors: C. C. Fain, J. G. Goree, H. J. Rack, G. C Robinson, J. S. Wolf; *Associate Professors:* M. Grujicic, J. M. Kennedy, E. C. Skaar

304 Metallographic Analysis 3(1,6) Laboratory exercises will acquaint the student with typical industrial and research metallographic techniques involving specimen preparation and scientific photography. Standard and specialized laboratory equipment will be introduced and used with emphasis on relating metallographic observations to material properties.

405, 605 Physical Metallury 3(3,0) Comprehensive treatment of electron theory, latice defects, diffusion, solutions and phase equilibria, phase transformations, creep and fracture applied to metals and simple alloys, with emphasis on structure-property relationships. *Preq:* CR E 310.

420, 620 Introduction to Mechanical Metallurgy 3(3,0) Introduction to the elastic and plastic response of metals to pressure. Topics include the mechanisms and consequences involving ductility, brittleness, crystallography, fatigue, and creep. *Preq:* CR E 310 or equivalent.

422, 622 Introduction to Chemical Metallurgy 3(3,0) Application of structural and physical chemistry concepts to metallurgical systems. Emphasis is placed upon problem solving by both numerical and graphical methods. Major topics include bonding, intermetallic bonding, intermetallic compounds, solid solutions, and heterogeneous equilibria. *Preq:* CR E 310 or equivalent; CH 331.

424, 624 Introduction to Extractive Metallurgy 3(3,0) Introduction to the economics, techniques, and theory of extracting metals from their ores. Emphasis is placed upon the chemistry and mechanics of extraction through problems involving efficiencies and yields of various metallurgical processes. *Preq:* CR E 310 or equivalent. *Coreq:* CH 331.

450, 650 Special Topics in Materials Engineering 1-4(0-4,12-0) Comprehensive study of a topic of current interest in the field of materials engineering. May be taken for credit more than one time. *Preq:* Consent of instructor.

800 Seminar in Materials Research 1(1,0)

820 Deformation Mechanisms in Solids 3(3,0)

822 Chemical Metallurgy 3(3,0)

824 Extractive Metallurgy 3(3,0)

826 Phase Equilibria in Materials Systems 3(3,0)

827 Kinetics of Phase Transformation 3(3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

MATHEMATICAL SCIENCES (MTHSC)

Professors: K. Alam, J. V. Brawley, Jr., F. M. Cholewinski, P. M. Dearing, R. E. Fennell, W. R. Hare, Jr., R. E. Haymond, P. T. Holmes, R. E. Jamison, J. P. Jarvis, C. D. Jeffries, J. W. Kenelly, J. D. Key, M. M. Kostreva, R. C. Laskar, D. R. LaTorre, R. F. Ling, J. K. Luedeman, W. F. Moss III, P. R. Nelson, T. G. Proctor, J. A. Reneke, R. D. Ringeisen, *Head;* W. H. Ruckle, D. R. Shier, K. T. Wallenius, D. D. Warner; *Associate Professors:* W. P. Adams, A. K. Bose, J. R. Brannan, C. L. Cox, A. S. Cover, V. J. Ervin, J. C. Harden, Jr., P. C. Kiessler, C. B. Russell, H. F. Senter, K. Seo, F. E. Sullivan; *Assistant Professors:* I. B. Fetta, D. A. Grable, K. B. Kulasekera, J. G. LaTorre, J. H. Nicholson, B. A. Novick, J. K. Peterson, M. J. Saltzman, M. M. Wiecek-Walkawiak, C. L. Williams, H. Zhang-Sun; *Lecturers:* P. F. Garner, C. R. Harris, P. K. Turner; *Visiting Associate Professor:* J. R. Sullivan; *Visiting Assistant Professor:* R. E. Lee; *Adjunct Professor:* D. E. Cameron

101 Finite Probability 3(3,0) Topics include probability, discrete random variables, and probability distributions. May not be taken by students who have successfully completed MTHSC 301. *Preq:* A satisfactory score on the Mathematics Test, Level II (Standard) or consent of instructor.

102 Introduction to Mathematical Analysis 3(3,0) An intuitive approach to the concepts and applications of calculus. Topics include functions and graphing, differentiation, and integration. Applications from social, biological, and management sciences are presented. Not open to those receiving credit for MTHSC 106. *Preq:* A satisfactory score on the Mathematics Test, Level II (Standard) or consent of instructor.

104 College Algebra 3(3,1) Basic course in college algebra designed to prepare students for more advanced courses in finite probability, mathematical analysis, and elementary statistics. Fundamental concepts of algebra, algebraic equations and inequalities, functions and graphs will be studied. Students who have received credit for MTHSC 102 or 105 or 106 will not be allowed to enroll in or receive credit for MTHSC 104.

105 Precalculus 5(5,1) Extensive treatment of topics chosen to prepare students for the study of calculus. Special emphasis is given to polynomial, rational, exponential, loga-

rithmic and trigonometric functions and their graphs, as well as basic and analytic trigonometry. Students who have received credit for MTHSC 102 or 104 or 106 will not be allowed to enroll in or receive credit for MTHSC 105.

106, H106 Calculus of One Variable I 4(4,0) Topics include analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, exponential and logarithm functions. *Preq:* MTHSC 105, or a satisfactory score on the Mathematics Test, Level II (Standard) or consent of instructor.

108, H108 Calculus of One Variable II 4(4,0) Topics include infinite series, limits, differentiation and techniques of integration. *Preq:* MTHSC 106.

109 Algebra and Trigonometry for Teachers 3(3,0) Unified course in algebra and trigonometry. Complex number system, functions, graphs, solving equations and inequalities, trigonometry, sequences, series, combinations, and permutations. A refresher course for teachers assigned to teach in a school's college preparatory program. Enrollment limited to inservice teachers.

110 Analytic Geometry for Teachers 3(3,0) Algebraic techniques applied to geometry; lines, conic sections and their graphs; transformations of coordinates; general second-degree equations; parametric equations; polar coordinates. Restricted to inservice teachers. *Preq:* MTHSC 109 or equivalent.

115 Contemporary Mathematics for Elementary School Teachers I 3(3,0) Logic, sets, and the properties of the counting numbers, numeration systems. Open to Elementary Education majors only. *Preq:* Consent of instructor.

116 Contemporary Mathematics for Elementary School Teachers II 3(3,0) Continuation of MTHSC 115. Subtraction, properties of the integers, elementary number theory, rational number system, real number system. Open to Elementary Education majors only. *Preq:* MTHSC 115 or consent of instructor.

119 Introduction to Discrete Methods 3(3,0) Topics normally will include elementary logic and methods of proof; sets, functions, and relations; graphs and trees; combinatorial circuits and Boolean Albegra. *Preq:* Satisfactory score on the Mathematics Test, Level II (Standard).

129 Problem Solving in Discrete Mathematics 3(2,2) A problem-solving approach to learning mathematics will be applied to topics in modern discrete mathematics. Typical selection of topics will include logic and proof, sets, relations, functions, mathematical induction, graphs and trees, counting techniques, recurrence equations. For Bachelor of Science and Bachelor of Arts majors in Mathematical Sciences only. Credit may not be received for both MTHSC 119 and 129. *Preq:* MTHSC 106.

203 Elementary Statistical Inference 3(3,0) Survey course in fundamental statistical principles with applications. Topics include estimation, tests of hypotheses, regression and correlation, analysis of variance, and nonparametric statistics. May not be taken by students who have passed MTHSC 301. *Preq:* MTHSC 101.

206, H206 Calculus of Several Variables 4(4,0) Topics include real valued functions of several variables, multiple integration, differential calculus of functions of several variables, vector field theory. *Preq:* MTHSC 108.

207 Multivariable Calculus 3(3,0) Introduction to the calculus of several variables, differential calculus and optimization of several variables, multiple integrals. Topics from the management sciences will be used to illustrate the above concepts. May not be taken by students who have passed MTHSC 206. *Preq:* MTHSC 102, or 106 with consent of instructor.

208, H208 Introduction to Ordinary Differential Equations 4(4,0) Introduction to the study of differential equations and their application to physical problems. Topics include exact, series, and numerical solutions; solutions by means of Laplace transforms; and solutions of systems of differential equations. *Preq:* MTHSC 206.

210 Applied Matrix Algebra 3(3,0) Introduction to the basic principles of matrix algebra with applications to the behavioral and managerial sciences. The major areas of application will include linear programming, directed graphs, and game theory. *Preq:* MTHSC 101 and 102 or 106.

215 Algebra for Elementary School Teachers 3(3,0) Linear equations and linear ine-

qualities in one variable, functions and graphs, systems of linear equations and linear inequalities, quadratic equations, complex number system. Finite number systems, algebraic structures. Open to Elementary Education majors only. *Preq:* MTHSC 216.

216 Geometry for Elementary School Teachers 3(3,0) An informal treatment of the basic concepts of geometry. Open to Elementary Education majors only. *Preq:* MTHSC 116 or consent of instructor.

231 Mathematics of Life Insurance 3(3,0) Introduction to the basic mathematics of finance and life insurance. Topics include compound interest, annuities certain, mortality tables, life annuities, net premiums, net level reserves, modified reserves, nonforfeiture values and dividends.

232 Actuarial Science Seminar I 1(1,0) Problem-solving seminar designed to prepare the student for the Society of Actuaries Examination I (General Mathematics). *Preq:* MTHSC 206.

250 Introduction to Mathematical Sciences 1(1,0) Lectures and discussions on the mathematical sciences disciplines: Applied Mathematics, Computing Science, Core Mathematics, Management Science, Operations Research, and Statistics. *Preq:* MTHSC 106.

301, H301 Statistical Theory and Methods I 3(3,0)[1] Principal topics include elementary probability theory, discrete and continuous random variables, expected values, normal distribution, chi-square distribution, t-distribution, F-distribution, tests of hypotheses, point and interval estimation, curve fitting. *Preq:* MTHSC 106 or 207 or 210.

302 Statistics for Science and Engineering 3(3,0)[1] Methodology for collecting, organizing and interpreting data. Topics include understanding variability, graphical and numerical summarization of data, introductory probability, normal and related distributions, statistical inference, experimental design, simple linear regression. Statistical microcomputer software will be used. *Preq:* MTHSC 206.

308 College Geometry 3(3,0) Theorems and concepts more advanced than those of high school geometry. A treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. *Preq:* MTHSC 106.

311, H311 Linear Algebra 3(3,0) Introduction to the algebra of matrices, vector spaces, polynomials, and linear transformations. *Preq:* MTHSC 108 or consent of instructor.

360 Intermediate Mathematical Computing 3(3,0) Continuing study of mathematical computing using the FORTRAN language. Emphasis on subroutine computation with applications to problems in science and engineering. *Preq:* CP SC 110 or consent of instructor.

400, H400, 600 Theory of Probability 3(3,0) Principal topics include combinatorial theory, probability axioms, random variables, expected values; special discrete and continuous distributions, jointly distributed random variables, correlation, conditional expectation, law of large numbers, central limit theorem. *Preq:* MTHSC 206 or consent of instructor.

401, H401, 601 Statistical Methodology 3(3,0) Probability-based treatment of statistical methods. Topics include point and interval estimation, hypothesis testing, analysis of variance, regression and correlation, analysis of categorical data, and distribution-free procedures. *Preq:* MTHSC 311 and 400.

403, H403, 603 Introduction to Statistical Theory 3(3,0) Principal topics include sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypotheses, likelihood ratio methods, regression and correlation analysis, introduction to analysis of variance. *Preq:* MTHSC 400 or equivalent.

405, 605 Statistical Theory and Methods II 3(3,0) Principal topics include simple linear regression, multiple regression and correlation analysis, one-way analysis of variance, multiple comparison, multifactor analysis of variance, experimental design. Computation and interpretation of results are facilitated through use of statistical computer packages. *Preq:* MTHSC 301.

[1]Credit will be given toward graduation for only one of the following: EX ST 301, MTHSC 301, 302.

406, 606 Sampling Theory and Methods 3(3,0) Probability-based treatment of sampling methodology. Theory and application of estimation techniques will be treated using simple and stratified random sampling, cluster sampling, and systematic sampling. *Coreq:* MTHSC 401.

407, 607 Regression and Time-Series Analysis 3(3,0) Theory and application of the regression and time series. Approaches to empirical model building and data analysis are treated. Computation and interpretation of results are facilitated through the use of interactive statistical packages. *Preq:* MTHSC 401.

408, 608 Topics in Geometry 3(3,0) Introduction to topics in special geometries which include non-Euclidean space concepts such as projective geometry, finite geometries, and intuitive elementary topology. A brief introduction to vector geometry. *Preq:* MTHSC 206.

410 Number Theory 3(3,0) Introduction to the theory of integers and related number systems. Topics include historical development, principle of mathematical induction, divisibility, primes, congruences, number-theoretic functions, primitive roots, quadratic residues, and diophantine equations. *Preq:* MTHSC 108 or consent of instructor.

412, H412, 612 Introduction to Modern Algebra 3(3,0) Introduction to the concepts of algebra. Topics included are the number system and the elementary theory of groups, rings, and fields. *Preq:* MTHSC 311.

415, H415 Introduction to Topology 3(3,0) Introduction to point set topology; Hausdorff, regular and normal spaces; metric, connected and compact spaces; continuous mappings and homeomorphisms. *Preq:* MTHSC 206.

419, H419, 619 Discrete Mathematical Structures I 3(3,0) This course applies theoretical concepts of sets, functions, binary relations, graphs, Boolean algebras, propositional logic, semigroups, groups, homomorphisms, and permutation groups to computer characteristics and design, words over a finite alphabet and concatenation, binary group codes, and other communication or computer problems. *Preq:* MTHSC 311.

420, 620 Discrete Mathematical Structures II 3(3,0) This course applies graph theory, ring and field theory, cardinality of sets, and difference equations of Nim games and other perfect information games, transport networks, shortest route problems, polynomial codes, Bose-Chandhuri-Hoquenghem codes, machine computability, mathematical linguistics, and different codes. *Preq:* MTHSC 412, 419, or consent of instructor.

425, H425 Orthogonal Functions and Boundary Value Problems 3(3,0) Continuation of MTHSC 208. Introduction to Fourier Series, numerical methods, partial differential equations, and certain special functions is given. *Preq:* MTHSC 208.

432 Actuarial Science Seminar II 1(1,0) Problem-solving seminar designed to prepare the student for the Society of Actuaries Examination 2 (probability and statistics). *Preq:* MTHSC 403 may be taken concurrently or consent of instructor.

434, 634 Advanced Engineering Mathematics 3(3,0) Fourier series, Laplace and Fourier transform and numerical methods for solving initial value and boundary-value problems in partial differential equations are developed. Applications to diffusion wave and Dirichelet problems are given. Matrix methods and special functions are utilized. *Preq:* MTHSC 208.

435, H435, 635 Complex Variables 3(3,0) Elementary functions. Differentiation and integration of analytic functions. Taylor and Laurent series. Contour integration and residue theory. Conformal mapping. Schwartz-Christoffel transformation. *Preq:* MTHSC 206.

440, H440, 640 Linear Programming 3(3,0) Introduction to linear programming covering the simplex algorithm, duality, sensitivity analysis, network models, formulation of models, and the use of simplex codes to solve, interpret, and analyze problems. *Preq:* MTHSC 206, 311, or consent of instructor.

441, H441, 641 Introduction to Stochastic Models 3(3,0) Introductory treatment of stochastic processes, finite-state Markov chains, queueing, dynamic programming, Markov decision processes, reliability, decision analysis and simulation. Both theory and applications will be stressed. *Preq:* MTHSC 400.

450 Introduction to Mathematical Models 3(3,0) Study of the modeling process which will include the translation of practical problems into mathematical models, the solution of the mathematical models, and the interpretation of the solution back into practical problems. Examples will be chosen from the physical, biological, social, and management sciences. *Preq:* CP SC 110, MTHSC 208. *Coreq:* MTHSC 401 or consent of instructor.

453, H453, 653 Advanced Calculus I 3(3,0) Limits, continuity, and differentiation of functions of one and several variables, the Riemann integral, and vector analysis. *Preq:* MTHSC 206.

454, H454, 654 Advanced Calculus II 3(3,0) Continuation of MTHSC 453. Transformations, multiple integrals, line and surface integrals, infinite sequences and series, and improper integrals.

457, 657 Applied Mathematics I 3(3,0) Formulation and analysis of mathematical models of phenomena in the natural sciences. Probabilistic foundations of diffusion theory. Dimensional analysis, scaling, asymptotic series, and perturbation methods. Examples from biology, classical mechanics, and physical chemistry. *Preq:* MTHSC 425, 434, or 454.

458, 658 Applied Mathematics II 3(3,0) Continuation of MTHSC 457. *Preq:* MTHSC 457.

460, 660 Introduction to Numerical Analysis I 3(3,0) Introduction to the problems of numerical analysis emphasizing computational procedures and application. Topics include sources of error and conditioning, matrix methods, systems of linear equations, nonlinear equations, interpolation and approximation by splines, polynominals, and trigonometric functions. *Preq:* MTHSC 206 or 207 and 360 or eqivalent.

461, 661 Introduction to Numerical Analysis II 3(3,0) Continuation of MTHSC 460. Ordinary differential equations, boundary value problems, functional approximation, numerical solution of partial differential equations, and Monte Carlo techniques. *Preq:* MTHSC 208 and 460 or consent of instructor.

463, H463, 663 Mathematical Analysis I 3(3,0) Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity and convergence. Integration, differentiation, functions of several real variables, implicit function theory. *Preq:* MTHSC 206.

464, H464, 664 Mathematical Analysis II 3(3,0) Continuation of MTHSC 463.

481 Seminar in Mathematics 1-3(1-3,0) Attention will be focused upon mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis will be upon independent study and student use of previously acquired mathematical skills. Open to students only by invitation for not more than 3 hours credit.

700 Mathematical Computer Applications for Elementary Teachers 3(3,0)

701 Number Systems for the Elementary Grades 3(3,0)

702 Number Systems for the Middle Grades 3(3,0)

703 Modern Mathematics for Elementary School Teachers: Geometry 3(3,0)

705 Modern Mathematics for Elementary School Teachers: Algebra, Probability and Statistics 3(3,0)

707 Mathematics for Middle School Teachers: Algebra 3(3,0)

709 Mathematics for Middle School Teachers: Geometry 3(3,0)

710 Elementary Calculus from an Advanced Viewpoint I 3(3,0)

711 Elementary Calculus from an Advanced Viewpoint II 3(3,0)

712 Modern Algebraic Concepts 3(3,0)

715 Ordinary Differential Equations with Applications 3(3,0)

719 Discrete Mathematics 3(3,0)

721 Matrix Algebra I 3(3,0)

722 Matrix Algebra II 3(3,0)

723 Applications of Linear and Modern Algebra 3(3,0)
725 Combinatorial Mathematics for Teachers 3(3,0)
727 Analysis Concepts for Teachers I 3(3,0)
728 Analysis Concepts for Teachers II 3(3,0)
730 Modern Geometry for Teachers 3(3,0)
731 Non-Euclidean Geometry 3(3,0)
732 Projective Geometry 3(3,0)
741 Introduction to Linear Programming with Applications 3(3,0)
751 Fundamental Concepts of Calculus I 3(3,0)
761 Probability and Statistics for Teachers 3(3,0)
771 Numerical Methods in Secondary School Mathematics I 3(3,0)
772 Numerical Methods in Secondary School Mathematics II 3(3,0)
781 History of Mathematics 3(3,0)
783 Theory of Numbers 3(3,0)
791 Selected Topics in Mathematical Education 1-3(1-3,0)
800 Probability 3(3,0)
801 General Linear Hypothesis I 3(3,0)
802 General Linear Hypothesis II 3(3,0)
803 Stochastic Processes I 3(3,0)
804 Stochastic Processes II 3(3,0)
805 Data Analysis 3(3,0)
806 Nonparametric Statistics 3(3,0)
807 Applied Multivariate Analysis 3(3,0)
808 Reliability and Life Testing 3(3,0)
809 Time-Series Analysis, Forecasting and Control 3(3,0)
810 Mathematical Programming 3(3,0)
811 Nonlinear Programming 3(3,0)
812 Discrete Optimization 3(3,0)
813 Advanced Linear Programming 3(3,0)
814 Network Flow in Programming 3(3,0)
816 Network Algorithms and Data Structures 3(3,0)
817 Stochastic Models in Operations Research I 3(3,0)
818 Stochastic Models in Operations Research II 3(3,0)
819 Multicriteria Optimization 3(3,0)
820 Complementarity Models 3(3,0)
821 Linear Analysis 3(3,0)
822 Measure and Integration 3(3,0)
823 Complex Analysis I 3(3,0)
824 Complex Analysis II 3(3,0)
825 Introduction to Dynamical Systems Theory 3(3,0)
826 Partial Differential Equations 3(3,0)
831 Fourier Series 3(3,0)
837 Calculus of Variation and Optimal Control 3(3,0)
841 Applied Mathematics I 3(3,0)

842 Applied Mathematics II 3(3,0)
850 Computational Problems in Discrete Structures 3(3,0)
851 Abstract Algebra I 3(3,0)
852 Abstract Algebra II 3(3,0)
853 Matrix Analysis 3(3,0)
854 Theory of Graphs 3(3,0)
855 Combinatorial Analysis 3(3,0)
856 Applicable Algebra 3(3,0)
860 Introduction to Scientific Computing 3(3,0)
861 Advanced Numerical Analysis I 3(3,0)
862 Advanced Numerical Analysis II 3(3,0)
863 Digital Models I 3(3,0)
864 Digital Models II 3(3,0)
865 Data Structures 3(3,0)
881 Mathematical Statistics 3(3,0)
882 Monte Carlo Methods 3(3,0)
885 Advanced Data Analysis 3(3,0)
891 Master's Research. Credit to be arranged.
892 Master's Project Course 1(0,1)
900 Seminar in Preparing for College Teaching in the Mathematical Sciences 3(3,0)
901 Probability Theory I 3(3,0)
902 Probability Theory II 3(3,0)
907 Multivariate Analysis 3(3,0)
920 Introduction to Harmonic Analysis 3(3,0)
927 Functional Analysis I 3(3,0)
928 Functional Analysis II 3(3,0)
954 Advanced Graph Theory 3(3,0)
981 Selected Topics in Mathematical Statistics and Probability 1-3(1-3,0)
982 Selected Topics in Analysis 1-3(1-3,0)
983 Selected Topics in Computational Mathematics 1-3(1-3,0)
985 Selected Topics in Algebra and Combinatorics 1-3(1-3,0)
986 Selected Topics in Geometry 1-3(1-3,0)
988 Selected Topics in Operations Research 1-3(1-3,0)
991 Doctoral Research. Credit to be arranged.

MECHANICAL ENGINEERING (M E)

Professors: E. H. Bishop, W. E. Castro, M. W. Dixon, R. S. Figliola, J. L. Gaddis, J. G. Goree, C. O. Huey, Jr., E. H. Law, J. A. Liburdy, F. W. Paul, C. E. Przirembel, *Head;* H. J. Rack, J. S. Wolf, T. Yang; *Associate Professors:* D. E. Beasley, S. B. Biggers, M. Grujicic, I. Haque, J. M. Kennedy, N. F. Knight, Jr., R. Kumar, T. Wang; *Assistant Professors:* A. Bagchi, G. M. Fadel, C. C. Jara-Almonte, P. F. Joseph, C. D. Rahn, J. B. Riester, D. A. Zumbrunnen; *Lecturers:* L. P. Golan, C. K. Roby; *Adjunct Professor:* P. M. Taylor

201 Foundations of Engineering Design 3(3,0) The design process will be introduced, including methods to stimulate creativity and innovation. Further, basic physical components of engineering systems will be introduced, in the context of their use in engineering design. Also included are considerations of design documentation, pat-

ents, professional ethics and nontechnical, nonanalytical contraints in design. *Preq:* E G 208 (or concurrent enrollment), ENGR 180, PHYS 122 and Sophomore standing.

204 Manufacturing Processes for Engineering Materials I 3(3,0) Course deals with the processing science for metallic and other materials of interest to mechanical engineers. Emphasis is placed upon the interrelations between the structure, processing, and properties of materials. *Preq:* E M 201 and Sophomore standing.

208 Numerical Methods in Engineering 3(3,0) Application of undergraduate mathematics and basic engineering principles, with an emphasis on numerical methods in the solution of engineering problems. Problems will be drawn from dynamics, vibrations, kinematics, thermodynamics, heat transfer, fluid mechanics, electrical circuits, and other engineering fields. *Coreq:* MTHSC 208.

H300 Junior Honors Seminar 0 Designed to acquaint students enrolled in the Departmental Honors program with current research activities in the Department of Mechanical Engineering. The faculty will provide seminars where research interests are summarized. These seminars are planned to prepare students in choosing a research topic for the senior thesis. *Preq:* Departmental Honors student with Junior standing.

302 Mechanical Systems and Vibrations 3(3,0) Techniques for developing physical and mathematical models of mechanical systems are presented with the vibratory behavior of these systems being stressed. The system response is determined using classical mathematical analysis methods, simulation, Laplace transforms, and matrix methods. *Preq:* E M 202, M E 208, MTHSC 208.

304 Heat Transfer 3(3,0) Heat conduction in the steady and transient states, free and forced convection, radiation, combined modes, boiling and condensation. Analytical and numerical solutions to engineering heat transfer problems are emphasized. *Preq:* M E 208 and 311 or equivalent, MTHSC 208.

306 Fundamentals of Machine Design 3(3,0) Introduction to failure theory, fatigue analysis, and energy methods for deflection analysis. Integration of these topics with selected portions of mechanics of materials and application of them to the design and analysis of machine elements. *Preq:* E M 304.

310 Thermodynamics and Heat Transfer 3(3,0) Introduction to thermodynamics and heat transfer for nonmajors: Properties of liquids and gases, first and second law analysis, introduction to cycles for power and refrigeration, heat flow by conduction and radiation, and convective heat flow and heat exchangers. *Preq:* Junior standing in an Engineering curriculum.

311, H311 Engineering Thermodynamics I 3(3,0) First and second laws of thermodynamics applied to engineering systems. Properties of the ideal and real gases and vapors. Processes and introduction to power and refrigeration cycles. *Preq:* MTHSC 208, PHYS 221, Junior standing.

312 Engineering Thermodynamics II 3(3,0) Continuation of M E 311. Gas power cycles, thermodynamic relations, compressibility charts, mixtures and psychrometrics, combustion, and introduction to equilibrium. *Preq:* M E 311.

313 Instrumentation and Measurements 3(2,3) Principles of measurements, instrument accuracy, and performance characteristics. Modern instrumentation for measuring both static and dynamic pressure, temperature, fluid flow, speed, power, force, acceleration, etc. Uncertainty analysis, curve fitting, and technical report writing. Analog and digital computer methods for engineering experimentation. *Preq:* E C E 307, M E 302, Junior standing.

400 Senior Seminar 1(1,0) Seminars address the problems to be encountered by engineering graduates in professional practice. Invited lecturers as well as faculty provide the lectures and demonstrations. *Preq:* Senior standing.

402 Internship in Engineering Design 3(1,6) Student is given the opportunity to apply creatively his general knowledge of engineering in the solution of an open-ended design problem involving engineering systems, machines, or devices. The source of the problem is external to the University and the student's progress in its solution is monitored and evaluated by a faculty jury. *Preq:* Senior standing.

403 Manufacturing Processes for Engineering Materials II 3(2,3) This course deals primarily with the processing and manufacturing of products from metals, polymers, and composites of interest to mechanical engineers. Emphasis is placed upon the analytical aspects of processing. *Preq:* M E 204, 304, 306, 312, 313, 320.

405 Kinematics and Dynamics of Machinery I 3(3,0) Graphical, analytical, and numerical techniques are used in the dynamic analysis and synthesis of machines. Emphasis on the application of these analysis techniques to planar linkages. *Preq:* E M 202 and Senior standing.

407, 607 Applied Heat Transfer 3(3,0) Application oriented extension of M E 304, considering topics in transient conduction, flow of fluids, energy exchange by radiation, and mass transfer. Applications in heat-exchanger design with emphasis on economics and variation of operating conditions from the design point. *Preq:* M E 304 and consent of instructor.

409 Design of Thermal/Fluid Systems 3(3,0) A project-oriented design course in the areas of fluid mechanics, heat transfer, and thermodynamics. *Preq:* M E 304, 312, and E M 320.

411, 611 Gas Power Systems 3(3,0) Study of the effects of variation in specific heat, some fundamentals of compressible flow, combustion process, and chemical dissociation. The theoretical and actual processes associated with the gas turbine, thermal jet, thermal rocket, and spark ignition and compression ignition engines are analyzed. *Preq:* M E 312.

413 Thermal Systems Laboratory 1(0,3) Experimental investigations in the thermal/fluid science areas of heat transfer, fluid mechanics, and thermodynamics. Experiments include heat exchangers, drag, standard fan tests, and others. *Preq:* M E 304, 312, 313.

414 Mechanical Systems Laboratory 1(0,3) Investigations of natural phenomena arising within the areas of vibrations, control, machine dynamics, and machine design. Experiments include vibrations, frequency response, closed-loop control, fatigue, machine behavior, and others. *Preq:* M E 306, 313. *Coreq:* M E 405, 416.

415, H415 Undergraduate Research 1-3 Individual research projects to be conducted under the direct supervision and guidance of a faculty member. May be repeated for a maximum of 6 credits. *Preq:* Consent of instructor.

416 Control of Mechanical Systems 3(3,0) Physical modeling and feedback principles are presented for control of mechanical systems. Transient response, root locus and frequency response principles are applied to the control of basic mechanical systems such as electric motors, fluid tanks, or thermal processes. PID control laws are emphasized. *Preq:* M E 302, 313 (or concurrent enrollment).

417, 617 Control Systems Design 3(2,1) Analytical, simulation, and experimental methods are applied to control system design. Fundamentals of linear state variable and computer-control systems are introduced. Laboratory emphasis is placed on control-systems performance measurement, and control-system implementation including sensors and actuators. *Preq:* M E 416 or consent of instructor.

418 Finite Element Analysis in Mechanical Engineering Design 3(2,3) Introduction to the finite element method. Introduction to solid modeling, finite element modeling and analysis using commercial codes. Analysis strategies using finite elements. Applications to heat tyransfer, fluid flow and structures. *Preq:* E M 304 and 320 and M E 304 or consent of instructor.

420, 620 Energy Sources and Their Utilization 3(3,0) Covers the availability and use of energy sources such as fossil fuels, solar (direct and indirect) and nuclear. Addresses energy density and constraints to use (technical and economic) for each source. *Preq:* M E 312.

421, 621 Introduction to Compressible Flow 3(3,0) Introductory concepts to compressible flow. Methods of treating one-dimensional gas dynamics including flow in nozzles and diffusers, normal shocks, moving and oblique shocks, Prandtl-Meyer Flow, Fanno Flow, Rayleigh Flow, and reaction propulsion systems. *Preq:* E M 320, M E 311.

422, 622 Design of Gas Turbines 3(3,0) Guiding principles in gas turbine cycles are re-

viewed. Turbine and compressor design procedures and performance prediction for both axial and radial flow machines are presented. Methods of design of rotary heat-exchangers and retrofitting gas turbine for regenerative operation are presented. Design projects are used to illustrate the procedures. *Preq:* E M 320, Senior standing.

423, 623 Introduction to Aerodynamics 3(3,0) Basic theories of aerodynamics are presented with the purpose of accurately predicting the aerodynamic forces and moments which act on a vehicle in flight. *Preq:* E M 320, Senior standing.

425, 625 Kinematics and Dynamics of Machinery II 3(3,0) Graphical, analytical, and numerical techniques are used in the dynamic analysis and synthesis of machines. Emphasis on the application of the analysis techniques to cams, gears, and other mechanisms. *Preq:* M E 405.

429, 629 Thermal Environmental Control 3(3,0) Mechanical vapor compression refrigeration cycles, refrigerants, thermoelectrical cooling systems, cryogenics, thermodynamic properties of air, psychometric charts, heating and cooling coils, solar radiation, heating and cooling loads, insulation systems. *Preq:* M E 312.

431 Applied Fluids Engineering 3(3,0) Applications-oriented course in industrial fluids engineering, primarily directed toward the analysis and design of piping systems and components for liquid and gas flow. Topics include friction factors, head loss, flow capacities, piping networks, flow measurement, pumps, control valves, and hydraulic and pneumatic components. *Preq:* E M 320, M E 313.

440 Materials for Aggressive Environments 3(3,0) Emphasizes the engineering aspects of selecting materials for applications in aggressive environments. Various types of materials degradation are discussed as are methods for wastage prevention, including especially engineering design and materials selection approaches. Structural metallic alloys are emphasized; however, technically important ceramics and polymers are also discussed. *Preq:* M E 201, 204 and 306 or equivalents.

453, 653 Dynamic Performance of Vehicles 3(3,0) Introduces techniques for analyzing the dynamic behavior of vehicles. Types of vehicles to be considered will be chosen from aircraft, surface ships, automobiles and trucks, railway vehicles, and magnetically levitated vehicles. *Preq:* M E 208 and 302.

454, 654 Design of Machine Elements 3(3,0) Design of common machine elements including clutches, brakes, bearings, springs, and gears. Optimization techniques and numerical methods are employed as appropriate. *Preq:* M E 208, 306, or consent of instructor.

455, 655 Design for Computer-Automated Manufacturing 3(3,0) Concepts of product and process design for automated manufacturing are considered. Topics include product design for automated manufacturing, inspection and assembly, using automation, industrial robots, knowledge-based systems and concepts of flexible product manufacture. *Preq:* M E 204, 306. *Coreq:* ME 403 or consent of instructor.

456, 656 (E C E) Design and Application of Industrial Robots 3(3,0) Considers the mechanics and control of industrial robots and their application to manufacturing problems. Topics covered include robot geometry, kinematics, and dynamics; servomechanisms, control and process application; programming; and integration into manufacturing applications. *Preq:* M E 416 or consent of instructor.

493, 693 Selected Topics in Mechanical Engineering 1-6 (1-6,0) Study of topics not found in other courses. May be repeated for a maximum of 6 credits, but only if different topics are covered. *Preq:* Consent of instructor.

701 Applications of Engineering Analysis 3(3,0)

801 Foundations of Fluid Mechanics 3(3,0)

807 Mechanical Systems 3(3,0)

810 Macroscopic Thermodynamics 3(3,0)

811 Gas Dynamics 3(3,0)

812 Experimental Methods in Thermal Science 3(2,2)

814 Concepts of Turbulent Flow 3(3,0)

815 (PHYS) Statistical Thermodynamics I 3(3,0)
816 Energy Conversion 3(3,0)
817 Combustion Theory 3(3,0)
818 Introduction to Finite Element Analysis 3(3,0)
819 Computational Methods in Thermal Sciences 3(3,0)
820 Modern Control Engineering 3(3,0)
821 Advanced Control Engineering 3(3,0)
822 Computer Control of Automated Machines 3(3,0)
830 Conduction Heat Transfer 3(3,0)
831 Convective Heat Transfer 3(3,0)
832 Radiative Heat Transfer 3(3,0)
833 Heat Transfer with Change of Phase 3(3,0)
841 Advanced Mechanical Engineering Design I 3(3,0)
842 Advanced Mechanical Engineering Design II 3(3,0)
843 Nonlinear Dynamics of Mechnical Systems 3(3,0)
844 Random Vibrations: Theory and Measurement 3(3,0)
845 Vibration of Continuous Media 3(3,0)
851 Tribology 3(3,0)
854 (E C E) Analysis of Robotic Systems 3(3,0)
859 (E C E) Intelligent Robotic Systems 3(3,0)
890 Engineering Project 1-3(0,3-9)
891 Master's Research. Credit to be arranged.
893 Selected Topics in Mechanical Engineering 1-6(1-6,0)
930 Advanced Topics in Heat Transfer 1-6(1-6,0)
931 Advanced Topics in Fluid Mechanics 3(3,0)
932 Advanced Topics in Thermodynamics 3(3,0)
991 Doctoral Research. Credit to be arranged.

MEDICAL TECHNOLOGY (M T)

Coordinator: M. V. Ruppert

Anderson Memorial Hospital *Adjunct Professor:* A. S. Hollingsworth, Jr.; *Adjunct Assistant Professor:* G. L. Huff

McLeod Regional Medical Center (Florence) *Adjunct Associate Professor:* V. Hyman; *Adjunct Assistant Professor:* V. T. Anderson

101 Introduction to Medical Technology 1(1,0) Introduction to the operation and practices in a medical laboratory. This course is designed to integrate the academic year with the clinical year. Included will be lectures on current laboratory practices, a visit to a modern medical laboratory, current training of laboratory personnel and seminars on areas of specialization.

401 Immunology 3(2,4) Presents the principles of serology and immunology and the tests utilizing these principles to detect abnormalities helpful in the diagnosis of disease. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

402 Clinical Microbiology 8(4,11) Principles of microbiology: bacteriology, mycology, virology, and parasitology. Emphasis is placed on human pathogenic organisms, using both fresh and prepared organisms. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

403 Hematology and Hemostasis 5(3,7) Information on blood as a tissue, the theory of hematological and hemostasis (coagulation) tests, factors that affect test reliability.

Knowledge of blood dyscraseas. Skill in the performance of hematological and hemostasis tests is emphasized and the use of automation techniques is covered. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

404 Blood Bank 4(2,6) History and principles of blood-group systems and methods of cross matching. Selection, pretesting, and bleeding of donors and processing of blood for transfusions, including component therapy. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

407 Urinalysis 2(1,3) Study of renal function together with principles of urine analysis and anatomy of the urinary system. Emphasis is placed on laboratory procedures and their utilization to detect abnormalities helpful in the diagnosis of disease. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

408 Clinical Chemistry 10(6,14) Chemical principles as applied to the analysis of biochemical substances and to physiological processes of clinical importance. Emphasis is placed on the chemistry of blood and urine. Advanced laboratory instruments, statistical analysis, and quality control concepts are covered. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

491 Special Topics in Medical Technology 2(1,4) Some or all of the following topics will be covered during the clinical experience: cell physiology, educational principles, laboratory management, scientific reports, research problems, etc. The manner in which the accredited hospital administers the special topics will vary somewhat due to the institutional differences. *Preq:* Senior standing in Medical Technology and enrollment in a clinical program.

495 Medical Technology Clinical Studies 0-17 General enrollment course for students in hospital phase. Specific medical technology credits awarded at end of clinical year. *Preq:* Senior standing in Medical Technology.

MICROBIOLOGY (MICRO)

Professors: J. D. Gangemi, S. S. Hayasaka, E. L. Kline, L. L. Larcom, J. W. Lawson, Jr., M. J. B. Paynter, *Head;* T. E. Schwedler, F. J. Stutzenberger; *Associate Professors:* S. F. Barefoot, T. A. Hughes; *Adjunct Professor:* E. J. Brandt, W. Schmidt III, S. W. Smith, Jr.

100 Microbes and Human Affairs 1(1,0) An explanation of the roles of microorganisms in today's world and the significance of microbes to the future of mankind.

205 Introductory Microbiology 4(3,3) Basic concepts of microbiology are introduced through classroom and laboratory experiences. Emphasis is on practical applications in various areas of importance to man. Recommended for students not majoring in a biological science. Not open to Microbiology majors. *Preq:* CH 101 and 102, BIOL 103.

305, 605 General Microbiology 4(3,3) Morphology, physiology, classification, distribution, and cultivation of microorganisms and health. *Preq:* Introductory biology, CH 101, 102, or 112.

400, 600 Public Health Microbiology 3(3,0) Epidemiology of transmissible diseases including pathogenic characteristics of the infectious organism, modes of transmission, mechanism of infection, diagnostic aids, effective treatments, immunizing procedures and methods of preventing infection. *Preq:* MICRO 305.

401, H401, 601 Advanced Bacteriology 4(2,6) Metabolism, nutrition, growth, and death of bacteria; microbiological assays and industrial fermentation; emphasis on laboratory procedures for the identification of the more common taxonomic groups. *Preq:* CH 201 or 223, 227, MICRO 305.

403, 603 Marine Microbiology 3(2,3) Discussion of the microbes that inhabit the marine environment, their peculiar physiological traits, and contributions to the ecology of oceans. *Preq:* MICRO 305, Organic Chemistry.

407, H407, 607 Food and Dairy Microbiology 4(3,3) Physical-chemical factors limiting survival and growth of microorganisms during processing and manufacturing of food and dairy products. Standard methods for enumerating and identifying indicator bacteria, yeasts, molds and microbes producing food and foodborne illness. Starter cultures, fungal toxins, microbial cell injury and standards for food and dairy products. *Preq:* BIOCH 210 or CH 201 or 223, MICRO 305.

410, H410, 610 Soil Microbiology 3(2,3) Role of microorganisms in the decomposition of organic substances, transformation of nitrogen and mineral substances in the soil; interrelationships between higher plants and microorganisms; importance of microorganisms in soil fertility. *Preq:* MICRO 305.

411, H411, 611 Pathogenic Bacteriology 4(3,3) Study of pathogenic bacteria, their morphology, cultural requirements and classification; diagnostic tests, methods of differentiation, and the disease caused. *Preq:* MICRO 305.

412, H412, 612 Bacterial Physiology 4(3,3) Consideration of the cytology, physiology, metabolism, and genetics of bacteria. Included will be studies of growth and death, reproduction and mutation, nutrition and metabolic pathways, regulatory mechanisms, and effects of environment. *Preq:* CH 224, MICRO 305, one semester of biochemistry, or consent of instructor.

413, H413, 613 Industrial Microbiology 3(2,3) Microbial aspects of large-scale processes for the production of foods, antibiotics, enzymes, fine chemicals, and beverages. Topics include strain selection, culture maintenance, biosynthetic pathways, continuous cultivation and production of single cell protein. *Preq:* MICRO 305.

414, H414, 614 Basic Immunology 3(2,3) Consideration of the nature, production, and function of basic immune responses in animals. Procedures and mechanisms of antigen-antibody and other immune reactions. *Preq:* MICRO 305, Organic Chemistry.

415, H415, 615 Microbial Genetics 4(3,3) Cytological basis of bacterial, fungal, and viral genetics; molecular aspects; mutations; mechanisms of genetic transfers; episomes and plasmids; and population changes. *Preq:* BIOCH 301, CH 224, MICRO 305, or consent of instructor.

416, H416, 616 Introductory Virology 3(3,0) General introduction to the field of virology, including animal, bacterial, and plant viruses. Topics will include nomenclature and classification, biochemical and biophysical characteristics, mechanisms of replication, chemotherapy, and techniques for isolation, assay and purification. *Preq:* BIOCH 301, MICRO 305, or consent of instructor.

417, H417, 617 Molecular Mechanisms of Carcinogenesis and Aging 3(3,0) Changes which occur at the cellular and subcellular levels during transformation and aging. Accumulated damage and "intrinsic clock" theories of aging; genetic and epigenetic theories of carcinogenesis; epidemiology of cancer; viral, radiation-induced and chemical carcinogenesis; the immune system and cancer. *Preq:* BIOCH 301, MICRO 305, or consent of instructor.

418, 618 (BIOSC, GEN) Biotechnology I: Nucleic Acids Techniques 4(2,4) See BIOSC 418.

491 Special Problems in Microbiology 1-3(0,3-9) Research problems in the various areas of microbiology designed to introduce undergraduate students to the planning and execution of research experimentation, and the presentation of research findings.

802 Bacteriological Technic 4(2,6)

803 Special Problems in Microbiology. Credit to be arranged.

804 Current Topics in Microbiology 1(1,0)

806 Pathogenesis and Infectious Disease 3(3,0)

807 Seminar 1(1,0)

810 Recombinant DNA and Genetic Engineering in Microbes 4(2,6)

811 Bacterial Cytology and Physiology 4(4,0)

812 Bacterial Metabolism 3(3,0)

815 Advanced Microbial Genetics 3(3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

MILITARY SCIENCE (M S)

Professor: G. Dechau, *Head; Assistant Professors:* B. J. Ivey, B. G. Lowman, T. M.

Markiewicz, E. C. Schwartz

101 Military Science (Basic) 1(1,2) This course examines the role of the Army in today's society, ranks and branches of the Army, principles and techniques of leadership. Laboratory periods provide training in physical conditioning, mountaineering, and weapons safety and firing. One hour lecture per week; two-hour laboratory every other week or equivalent.

102 Military Science (Basic) 1(1,2) Study of Army organization and doctrine with additional focus on pay and allowances, other forces, the noncommissioned officer, and fundamentals of first aid. Laboratory periods provide training in mountaineering, weapons safety and firing, and land navigation.

201 Military Science (Basic) I 1(1,2) Introductory study of U.S. Military Weapons Systems. Emphasis is on the historical and practical perspectives of current U.S. Army weaponry. Leadership laboratory provides the students practical experience in applying principles learned and experience in leadership and physical fitness.

202 Military Science (Basic) II 1(1,2) Introduction to principles or warfare and introduction to military land navigation. Leadership laboratory provides the students practical experience in applying the principles learned in class, in addition to experience in leadership and physical training.

301 Military Science (Advanced) 1(1,1) Small unit tactics: Analysis of the leader's role in directing and coordinating small units in the execution of offensive and defensive tactical missions. Cadets will participate in leadership laboratory training throughout the school year.

302 Military Science (Advanced) 2(2,1) Organizational leadership and methods of instruction. Study of relevant theories and concepts of organizational leadership and human behavior; techniques used in planning and presenting instruction. Continuation of leadership laboratory.

401 Military Science (Advanced) 1(1,1) Study of military operations, with emphasis on small unit leadership, training, and administration. Subject matter and leadership laboratories are designed to provide requisite knowledge and experience for commissioning and initial military assignment.

402 Military Science (Advanced) 2(2,1) Continuation of M S 401, with emphasis on military justice, law of warfare, and ethics. Subject matter and leadership laboratories are designed to provide requisite knowledge and experience for commissioning and initial military assignment.

MUSIC (MUSIC)

Professors: B. F. Cook, E. A. Freeman, L. U. Harder; *Associate Professors:* R. E. Goodstein, L. Hochheimer; *Assistant Professors:* N. M. Hosler, C. S. Pfender, D. R. Rash; *Visiting Instructor:* V. L. Hamilton

151 Applied Music 1(0,1) Individual study in performance medium (piano, voice, strings, woodwinds, brass, percussion). One thirty-minute private lesson each week, for which a minimum of 4 hours practice is required. The student is required to perform solo in a recital each semester. May be repeated for credit with departmental approval of differing performance media. *Preq:* Consent of instructor, based upon a qualifying audition.

152 Applied Music 1(1,0) Continuation of MUSIC 151. *Preq:* MUSIC 151.

205 Music Theory 3(3,0) Terminology and notation of traditional music are reviewed, and the techniques of sight-singing and sight-reading are practiced. Harmonic practices are studied, relating to the principal diatonic triads in all inversions. *Preq:* Consent of instructor, based on musical literacy.

206 Music Theory 3(3,0) Continuation of MUSIC 205 with emphasis on secondary chord structure, modulation, and nondiatonic harmony. Advanced sight-singing and melodic dictation are practiced. *Preq:* MUSIC 205.

210 Music Appreciation: Music in the Western World 3(3,0) Designed to deepen the student's appreciation of his musical heritage through a study of the elements of the musical language and its development in Western culture.

251 Applied Music 1(1,0) Continuation of MUSIC 152. *Preq:* MUSIC 152 and consent of instructor.

252 Applied Music 1(1,0) Continuation of MUSIC 251. *Preq:* MUSIC 251.

301 Special Topics in Music Appreciation 1(1,0) Broad survey of the many and varied aspects of the field of music in terms of media, composition, and performance and ranging in style from the oldest classics to the current popular idioms. Concert attendance is required.

305 Music Theory: Advanced Harmony 3(3,0) Study of harmonic usage involving chromaticism, free dissonance and atonality. Harmonic dictation is practiced. *Preq:* MUSIC 206.

306 Music Theory: Form Analysis 3(3,0) Principles of formal construction in music of all periods are studied by the inductive analysis of representative works. *Preq:* MUSIC 206.

311 Music Appreciation: American Music 3(3,0) Music in America from 1620 to the present. Indigenous and borrowed influences will be examined.

312 Introduction to Jazz 3(3,0) Comprehensive survey of jazz elements and styles. A historical perspective from Dixieland to bebop to jazz/rock is included.

315 Music History 3(3,0) Development of Western music from antiquity to 1750, emphasizing representative literature from various styles and periods.

316 Music History 3(3,0) Continuation of MUSIC 315. Music from 1750 to the present.

351 Applied Music 1(1,0) Continuation of MUSIC 252 for exceptional students, guiding the student in interpretation of advanced solo and ensemble literature. A minimum of eight hours weekly practice is required. Student is also required to perform an appropriate solo in the student recital. *Preq:* MUSIC 252, recommendation by the MUSIC 252 professor, and audition before the music faculty of two pieces of contrasting styles.

352 Applied Music 1(1,0) Continuation of MUSIC 351. Student is required to present a half-recital from memory at the close of the semester. Some, but not all, of the works performed could have been studied in a previous semester. *Preq:* MUSIC 351 and recommendation by the MUSIC 351 professor.

361 Marching Band 1(0,3)[1] Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit with a maximum of 8 hours of ensemble credit allowable toward a degree. Fall semester only. *Preq:* Consent of director.

362 Symphonic Band 1(0,3)[1] Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit with a maximum of 8 hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

363 Jazz Ensemble 1(0,3)[1] Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performance given periodically in addition to the minimum rehearsal time. May be repeated for credit with a maximum of 8 hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

365 University Chorus 1(0,3)[1] Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit with a maximum of 8 hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

366 Show Choir 1(0,3)[1] Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit with a maximum of 8 hours of ensemble credit allowable toward a degree. *Preq:*

[1]No more than a total of 8 semester credit hours earned in this group of courses (MUSIC 361, 362, 363, 365, 366, 367, 368, 369) may be used in meeting degree requirements.

Consent of director.

367 Chamber Singers 1(0,3)[1] Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit, with a maximum of 8 hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

368 Small Ensemble 1(0,3)[1] Ensembles: Devoted to the musical training of instrumental, vocal ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit with a maximum of 8 hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

369 Chamber Orchestra 1(0,3)[1] Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time. May be repeated for credit with a maximum of 8 hours of ensemble credit allowable toward a degree. *Preq:* Consent of director.

398 Special Topics in Music 3(3,0) Consideration of select areas of study in music not addressed by other music course offerings. May be repeated once for credit. *Preq:* Consent of instructor.

400 Music in the Elementary Classroom 3(3,0) Designed to give the teacher in the elementary classroom a familiarity with traditional, Kodaly, Orff, and Kindermusik approaches in correlating music with language arts, mathematics, and social studies.

401 Methods and Materials in Elementary School Music 3(3,0) Materials, methods and techniques in elementary school. *Preq:* MUSIC 400.

421 Vocal Arranging 3(3,0) Techniques of arranging for voices and accompanying instruments are studied and appropriate arrangements prepared. *Preq:* MUSIC 206.

422 Instrumental Arranging 3(3,0) Transpositions, characteristics and range of the instruments of the band and orchestra are studied. Techniques of arranging for small instrumental ensembles are studied and appropriate arrangements prepared. *Preq:* MUSIC 206.

499 Independent Studies 1-3(1-3,0) Tutorial work for students with special interests in music study outside the scope of existing courses. *Preq:* Consent of department head.

NURSING (NURS)

Professors: E. M. Baines, M. L. deChesnay, O. S. Hipps, R. B. Hughes, G. A. Tanner, *Interim Head; Associate Professors:* M. A. Kelly, P. M. Kline, E. J. Lee, F. M. Oglesby, S. M. Oldaker, A. B. Privette, R. H. Pruitt, M. B. Reichenbach, S. W. Thompson; *Assistant Professors:* C. L. Belcher, J. B. Bradberry, N. M. Longcrier, J. A. Milstead, R. A. Spadoni, J. L. Timms; *Lecturers:* P. A. Botchway, E. R. Hearn, D. L. Irvine, W. R. Jones, M. S. Reimer, D. F. Willoughby; *Visiting Assistant Professor:* L. M. Pullen; *Visiting Instructor:* P. R. Maybee; *Part-time Assistant Professor:* M. A. Wetsel; *Part-time Lecturers:* K. M. Brown, R. L. Carr, L. R. Cestari, C. H. Craig, J. H. Frost, B. E. Gibbs, K. P. Hardin

140 Computer Applications in Health Care 3(3,0) Designed to introduce students to the application of computers in the delivery of health care. The course will cover existing health-care applications and forecast future needs. Multiple computer systems will be discussed. Nursing majors will be given enrollment priority.

210 Health Assessment 3(2,3) Course introduces the concepts of health, wellness, and illness. Focus is on physical and psychosocial assessment for the well adult client with variations across the lifespan. Interviewing techniques are included. Practice of skills is provided in the laboratory sessions. Open only to Nursing majors.

211 Therapeutic Nursing Interventions 4(2,6) Focus on therapeutic nursing interventions, including selected psychomotor skills, communication skills and teaching/learning. Open only to Nursing majors. *Preq:* Sophomore standing.

230 Professionalism in Nursing 3(3,0) Analysis of the historical development of modern nursing. Consideration of nurses' professional roles, utilization of critical think-

ing, nursing process, nursing theory, and cultural sensitivity in relation to health-care delivery systems. Open only to Nursing majors.

240 Pharmacotherapeutic Nursing Interventions 3(3,0) Focus is on integration of nursing process with pharmacotherapeutics, administration, monitoring, and related client education. Includes major drug classifications, indications for use, side effects, interactions, routes of administration, usual dosages and contraindications. Open only to Nursing majors. *Preq:* Sophomore standing.

300 Seminar in Health Care Topics 1-4(1-4,0-9) Designed to provide individualized in-depth study in a selected health-care area. May have a clinical component and/or special projects. Open to non-Nursing majors. May be taken more than once for a maximum of 6 credits. *Preq:* Consent of instructor.

301, H301 Nursing Care of the Childbearing Family 4(2,6) Course focuses on health care of the childbearing family. Emphasis is placed on biological, psychological, and sociocultural concepts specific to the childbearing client throughout the childbearing process. *Preq:* NURS 211, 230, PSYCH 340. *Coreq:* NURS 304.

302, H302 Nursing Care of Children 4(2,6) A course which focuses on health problems of infants, children, and adolescents. Emphasis is placed on biological, pathophysiological, psychological, and sociocultural concepts related to nursing care of children with acute and chronic illnesses in hospital settings. Strategies for alleviation of illness, restoration of wellness and promotion and maintenance of normal growth and development of children are presented. *Preq:* NURS 216, 230, PSYCH 340. *Coreq:* NURS 304.

303 Nursing of Adults 7(3,12) Application of the nursing process in providing care to adults and/or families in the hospital setting. Emphasizes biological, psychological, and sociocultural influences on health problems. Alterations in cellular dynamics, respiration, circulation, musculo skeletal, neurological, elimination and perioperative care are included. Pharmacotherapeutics, nutrition, client education and discharge planning are discussed. *Preq:* BIOSC 223, NURS 211, 230. *Coreq:* NURS (HLTH) 304.

304 Pathophysiology for Health-Care Professionals 3(3,0) Focus is on disease mechanisms and recognition of the manifestations of these mechanisms in body systems. The discussion will also include pharmacologic and mechanical interventions commonly associated with specific disease processes and application to patient-care situations. *Preq:* BIOSC 223, consent of instructor.

315, H315 The Developing Family in the Community 4(3,3) Focus on childbearing clients, infants, children, and adolescents. Major emphasis on ways in which these individuals may achieve or maintain wellness in the family, home, and community environment. Identification of appropriate nursing strategy that will enhance wellness in the community. *Preq:* BIOSC 223, NURS 211, 230, PSYCH 340.

316, H316 Adult Nursing in the Community 4(3,3) Focus on nursing care of adults in family and community settings. Nursing interventions are identified that enhance health in the adult and and elderly client. Includes study of diverse life-style factors leading to increased or decreased well-being of the individual. *Preq:* BIOSC 223, NURS 211, 230, PSYCH 340, SOC 311.

330 Research in Nursing 2(2,0) Focus on an introduction to research in nursing. Analysis of reported research in nursing. Ethical, moral, and legal issues are discussed in relation to nursing research. *Preq:* NURS 230. *Preq/Coreq:* EX ST 301 or MTHSC 203.

350 (PHIL) Technology and Philosophy in Nursing 3(3,0) Analysis of the influence of the increasing application of scientific technology to health-care delivery and concomitant ethical issues.

401, H401 Mental Health Nursing 4(2,6) Study of the ways in which adults interpret and cope with changes in their life patterns utilizing models of crisis intervention. Emphasis is on understanding the dynamics of human relationships as well as the therapeutic role of the nurse. *Preq:* All required 300-level nursing courses.

402, H402 Long-Term Nursing Care 3(1,6) Focus on concepts and issues basic to long-term care. *Preq:* All required 300-level nursing courses.

403, H403 Complex Nursing of Adults 6(4,6) Focus on the biological, psychological, philosophical, and sociocultural influences on complex health problems related to acute and traumatic conditions. Emphasis on the concepts of circulation, oxygenation, homeostasis, and compensation in acutely ill adults. *Preq:* All required 300-level nursing courses.

404, H404 Nursing Management 3(1,6) Focus on principles of management and leadership as applied to nursing. Role, legal/ethical issues, health-care delivery systems, accountability and research will be considered. *Preq:* All required 300-level nursing courses.

406 Issues in Professionalism 3(3,0) Analysis of the development of professional nursing. Consideration of educational issues, legal and economic issues, health policy, leadership, cultural variations and the influence of values in ethical decisions and nursing practice. *Preq:* Admission to RN/BS program.

407 Family Nursing in the Community 5(4,3) Focus on wellness-promotion strategies and nursing care of childbearing clients, infants, children, adolescents, adults and older adults in family and community settings. Includes study of diverse lifestyle factors related to health and well-being of individuals. *Preq:* NURS 210, Admission to RN/BS program.

415, H415 Community Health Nursing 3(2,3) Consideration of health promotion activities for community and population groups with emphasis on community assessment, screening, planning and health, and teaching/counseling. Practice activities will be related to health promotion in population groups. Laboratory settings include areas such as industries, schools, clinics, and other community agencies and organizations. *Preq:* All required 300-level nursing courses.

H426 Independent Study 4(2,6) Opportunity for indepth study in an area of special interest in clinical nursing. Laboratory experience is arranged with the instructor. Specific objectives are to be developed by the student with the consent of the instructor under whom the student wishes to study. *Preq:* All 300-level nursing courses except NURS 300 and consent of instructor.

430 Nursing Leadership and Health Policy 2(2,0) The role of professional nurse as a leader and activist is explored. Study of legal and ethical issues, political power, and change models help prepare the student for the transition to graduate nurse. *Preq:* All required 300-level nursing courses.

431 Care of the Hospitalized Child with Long-Term Illness 4(2,6) Role of nurse in caring for the child with a long-term or terminal illness with emphasis on adaptations to meeting basic child needs. Laboratory experience in facility providing hospitalization for children. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

432 Nursing Care of the Person in Crisis 4(2,6) Study of the person with an emotional crisis precipitated by either a physiological or psychological problem. Various theories concerning crisis situations and the nursing interventions necessary to deal with the person in crisis are presented. Nursing laboratory experience in a variety of settings with all age groups. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

434 Teaching Role of Nurse Practitioner 4(2,6) Study of the nurse's role in health teaching and application of principles of health promotion maintenance, and restoration. Student selection of a variety of health teaching situations and development of learning resources. Laboratory experience in a variety of settings with all age groups. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

437 Introduction to School Health Nursing 4(2,6) Role of nurse in school health programs with emphasis on the health care of the school age child in his usual environment, the home and school. Laboratory experience through schools and community care facilities. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

438 Coordination in Nursing Care 4(2,6) This course is designed to reinforce and expand the knowledge and skills needed in the coordination of nursing care. Guided activities in planning, implementing, and evaluating skilled nursing in clinical labora-

tory in health-care agencies. Participation in and evaluation of activities relating to the delivery of nursing-care services are emphasized. Limited enrollment. *Preq:* All 300-level nursing courses except NURS 300. *Preq /Coreq:* MGT 307 or SOC 430, NURS 430.

439 Nursing of the Aged 4(2,6) Designed to assist the senior student in bridging and synthesizing concepts extracted from a variety of disciplines and applying them to the nursing process in assessing, diagnosing, planning, implementing, and evaluating the care of the aged individual residing in the community. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

440 Nursing Care of the High-Risk Maternity Client and Her Infant 4(2,6) An indepth study of the high-risk maternity client, her family, and the high-risk infant. Laboratory in a variety of clinical settings. Limited enrollment. *Preq:* All 300-level nursing courses, except NURS 300.

441 Nursing Problems Related to Clients Coping with Cancer 4(2,6) Designed for increasing awareness and knowledge of the multidiciplinary approaches in oncology and the role of the oncology nurse specialist, and to form a basis for viewing cancer problems within a framework for nursing research. Clinical focus is on the assistance indicated for individuals with cancer and their families. Limited enrollment.

442 Nursing in Community Health Settings 4(2,6) Provides opportunity for application of the nursing process with clients in various community settings. Consideration will be given to principles of management and leadership, planning care for given population groups, and nursing roles in specialized areas. *Preq:* NURS 415.

443 Occupational Health Nursing 4(2,6) An indepth study of the role of the occupational health nurse with emphasis on health and safety risks in the workplace, screening, prevention, and wellness. *Preq:* All 300-level nursing courses except NURS 300.

444 Women's Health 4(2,6) Directed study of women's health concepts and issues. Classroom and clinical laboratory activities focus on health-care problems specific to women through the life span. *Preq:* All 300-level nursing courses except NURS 300.

470 Intensive Care Nursing of the Homebound Client 4(2,6) Focus on health problems of the critically ill client in the home. Consideration of high-tech nursing care, family support and health-care financing as they relate to the needs of the critically ill homebound client. *Coreq:* NURS 403 or consent of instructor.

471, H471, 671 Holistic Approaches to Health 3(3,0) Introduction to holistic approaches to nursing in the health-care system. Ways in which these approaches can be utilized within existing systems of nursing-care delivery to augment technological approaches are explored. *Preq:* Required 300-level courses in nursing curricula or consent of instructor.

485 Nurse Extern Practicum 6(0,18) Practicum consisting of preceptor-supervised and faculty-led nursing clinical experiences in a regional health-care facility. *Preq:* Completion of at least one adult health and one pathophysiology course or consent of instructor.

801 Family Health Nursing 3-4(3,0-3)

802 Advanced Leadership and Role 3(3,0)

804 Nursing Theory 3(3,0)

807 Nursing Research 3(3,0)

808 Nursing Research Analysis 3(3,0)

812 The Dynamics of Community Health 3(3,0)

825 Theories and Models of Nursing Administration 3(3,0)

826 Administration of Nursing Services 3(2,3)

827 Foundations of Nursing Education 3(3,0)

828 The Nurse Educator 3(2,3)

829 Theories and Models of Clinical Specialization 3(3,0)

830 Clinical Specialty Practicum in Nursing 3(1,6)

833 Rehabilitative Nursing I 6(3,9)

834 Rehabilitative Nursing II 6(3,9)

835 Advanced Nursing of Developing Children 5(3,6)

836 Advanced Nursing of Children with Health Deficits 5(3,6)

837 Advanced Nursing of Childbearing Families 5(3,6)

838 Advanced Nursing of Childbearing Families at Risk 5(3,6)

840 Advanced Gerontological Nursing I 5(3,6)

841 Advanced Gerontological Nursing II 5(3,6)

850 Information and Control Systems for Nursing Leadership 3(3,0)

861 Advanced Adult Nursing I 5(3,6)

862 Advanced Adult Nursing II 5(3,6)

879 Special Topics in Nursing 1-3(1-3,0-9)

881 Graduate Project. Credit to be arranged.

889 Special Problems in Nursing 1-6(1-6,0)

891 Master's Research. Credit to be arranged.

NUTRITION (NUTR)

(See also courses listed under Animal, Dairy and Veterinary Sciences; Biochemistry; Food Science; and Poultry Science)

Professors: A. B. Bodine II, D. L. Cross, R. J. Davis, D. M. Henricks, L. W. Hudson, M. E. Kunkel, D. V. Maurice, J. C. McConnell, Jr., F. E. Pardue, G. C. Skelley, Jr., W. P. Williams, Jr.; *Associate Professors:* E. H. Hoyle, T. C. Jenkins, D. D. Lee, Jr.; *Instructor:* E. C. Turner

201 Introduction to Nutrition 3(3,0)S Principles of the nutrition of domestic animals and man include sources, digestion, absorption, utilization and functions of nutrients; effects of dietary deficiencies; and nutrients required for maintenance, growth, reproduction, lactation, work, and egg-shell quality. *Preq:* BIOCH 210, CH 223, or consent of instructor.

203 Principles of Human Nutrition 3(3,0) Principles of nutrition including functions, digestion, and requirements of nutrients; factors affecting food choices and dietary adequacy; and roles of nutrition in physical fitness and health maintenance. May not be substituted for NUTR 401.

401, H401, 601 Fundamentals of Nutrition 3(3,0)F Biochemical and physiological fundamentals of nutrition applicable to domestic animals and man. Considered are digestive processes, and absorption and metabolism of carbohydrates, lipids, proteins, water, minerals and vitamins. Energy metabolism and comparative anatomy and physiology of digestive systems are discussed. *Preq:* BIOCH 210, CH 223, or consent of instructor.

425, H425, 625 Nutrition and Dietetics 3(3,0) Development of diets to meet human nutritional needs with emphasis on metabolic bases of dietary management of individuals with various disease states. *Preq:* NUTR 451 or equivalent.

451, H451, 651 Human Nutrition 3(3,0) Essentials of nutrition and principle nutritional deficiency conditions. Factors affecting adequacy of dietary intake, methods of determining nutritional status, development of nutrition standards, and recent advances in human nutrition. *Preq:* Consent of instructor.

455, 655 Nutrition and Metabolism 3(3,0) Concepts of metabolism fundamental to understanding normal and therapeutic nutrition will be examined. Bioenergetics as well as metabolism of carbohydrates, lipids, amino acids, vitamins, and minerals as they relate to nutrition will be discussed. *Preq:* NUTR 451 and BIOCH 210 or 423 or 406 or consent of instructor.

701 Therapeutic Nutrition 3(3,0)

702 Public Health Nutrition 3(3,0)

703 Nutrition Education 3(3,0)
704 Food Service Systems 3(3,0)
705 Nutrition Practicum 1-6(0,1-6)
706 Nutrition for Teachers 3(3,0)
721 Methods in Human Nutrition I 2(2,0)
722 Methods in Human Nutrition II 2(2,0)
801 Topical Problems in Nutrition 1-3
802 Special Topics in Nutrition 1-3(1-3,0-2)
808 Monogastric Nutrition 3(3,0)
809 Ruminant Nutrition 3(3,0)
811 Carbohydrate Nutrition 2(2,0)
813 Nutrition Techniques with Large Animals 2(1,3)
814 Nutrition Techniques with Laboratory Animals 2(1,3)
815 Lipid Nutrition 2(2,0)
816 Amino Acids and Protein Nutrition 2(2,0)
817 Mineral Nutrition 2(2,0)
819 Vitamin Nutrition 2(2,0)
820 Nutritional Bioenergetics 2(2,0)
851 Nutrition Seminar I 1(1,0)
852 Nutrition Seminar II 1(1,0)
891 Master's Research. Credit to be arranged.
991 Doctoral Research. Credit to be arranged.

PACKAGING SCIENCE (PKGSC)

Professor: R. D. Galyean; *Associate Professors:* R. F. Testin, P. J. Vergano; *Visiting Instructor:* L. H. Doar, Jr.; *Adjunct Professors:* D. E. Hudgin, H. J. Raphael; *Adjunct Associate Professor:* D. H. Johns; *Adjunct Assistant Professor:* C. A. Bjorkengren

101 Packaging Orientations 1(1,0) Overview of the various principles and practices in packaging science, historical development, packaging as a career.

102 Introduction to Packaging Science 2(2,0) The functions of a package; materials, processes and technology used in package development; the relationship of packaging to the corporation, consumer, and society as a whole. *Preq:* PKGSC 101 or consent of instructor.

200 Packaging Materials and Manufacturing 2(2,0) Detailed study of packaging materials including glass, metal, metal foils and sheets, wood, paper, paperboard, plastics, composites, adhesives, coatings, cushioning media; their functional properties in packaging application; and laminating and combining of different packaging materials. *Preq:* PKGSC 102 or consent of instructor.

204 Container Systems (Rigid and Flexible) 2(2,0) Examination of all the packages and containers used to develop systems to distribute products to the ultimate consumer. Compatibility of product and package, structural design, costs and merchandising considerations are stressed. *Preq:* PKGSC 200 or consent of instructor.

206 Container Systems Laboratory 1(0,3) Laboratory practice in sample making, designing and constructing various containers. *Preq:* PKGSC 204 or concurrent enrollment in PKGSC 204.

368, H368 Packaging and Society 3(3,0) Study of the role of packaging in modern-day society. Responsibilities of the packager to protect people and the environment. Package guidelines recommended by civilian and governmental agencies. *Preq:* PKGSC 102 or consent of instructor.

401 Packaging Machinery 3(3,0) A systematic study of machinery used to form, fill, seal, laminate, combine and print continuous and automated packaging lines and auxiliary material handling equipment, including principles of machine design, operation, selection, and specification. *Preq:* PHYS 207, PKGSC 204, or consent of instructor.

404, H404 Mechanical Properties of Materials and Principles of Package Evaluation 4 (4,0) Study of the properties of packaging materials, principles and standard methods (ASTM, TAPPI) of determining these properties. Evaluation of functional properties of packages including study of shock and vibration isolation. *Preq:* PHYS 207, PKGSC 200, 206, or consent of instructor.

420 Package Design and Development 3(3,0) Relationship between packaging and the marketing of consumer goods. Study of the various principles and methods practiced in developing packages, methods used to coordinate package development activities including interfacing with product development, manufacturing, marketing, and purchasing. *Preq:* PHYS 207, PKGSC 404, or consent of instructor.

454 Package Evaluation Laboratory 2(0,6) Laboratory experiments to determine properties or packaging materials and to evaluate the performance of packages including shipping test (shocks and vibration). Student learns how to operate standard testing apparatus and becomes familiar with industry-recognized test methods and standards. *Preq:* PKGSC 404 or consent of instructor.

PARKS, RECREATION AND TOURISM MANAGEMENT (PRTM)

Professors: L. R. Allen, *Head;* R. H. Becker, G. W. Burnett, L. W. Gahan, W. E. Hammitt, G. E. Howard, F. A. McGuire, R. W. McLellan, J. R. Pope, Jr.; *Associate Professors:* R. A. Conover, Jr., H. J. Grove, A. E. James, C. D. McDonald, M. K. McLellan, B. E. Trent, C. R. White, Jr.; *Assistant Professors:* S. J. Backman, M. F. Floyd, T. D. Potts, L. K. Toepper, M. H. Wynn; *Instructor:* J. H. Stevens, Jr.; *Lecturer:* B. W. Stevens

101 Concepts of Leisure 3(3,0) Introduces recreation professions and organizations: government, voluntary, and commercial. Overviews professional preparation. Outlines development of man's uses of leisure and evolution of recreation, city parks, natural resources conservation and preservation movements as philosophical forces affecting leisure services.

102 Issues in Leisure Services 3(3,0) Considers current trends, problems, laws, and issues affected by and/or affecting recreation in America.

104 Recreation Services Delivery Systems 3(3,0) Students will be introduced to the major delivery systems of Parks, Recreation and Tourism Management. The philosophy, clientele, current issues, and career opportunities within these areas will be studied. Enrollment limited to Parks, Recreation and Tourism Management majors.

201, H201 The Recreation/Leisure Environment 3(3,0) Discusses the development characteristics of built and natural environmental resource settings for recreation, tourism development, and community expression. Examines human/environment interactions during leisure, including both impacts of the recreation environment on people and people impacts on the recreation environment. Surveys public agencies and private interests in these settings.

203 Personal and Community Health 3(3,0) Course deals with health problems, disease prevention and control, school health practices, public health administration, and other health information which may enable one to live intelligently in today's complex society.

205 Program and Event Planning 3(2,3) Principles and methods of program development. Time and facility utilization for sports activities, social functions, arts and crafts, outdoor activities, hobbies or special-interest groups, and activities in the cultural and performing arts will be pursued. *Preq:* PRTM 101.

206 Practicum I 1(0,3) Provides the opportunity for a student to conduct a recreation program in a supervised setting. A minimum of 90 hours with a leisure agency approved by the University is required. To be taken Pass/Fail only. *Preq:* PRTM 205,

Sophomore standing in Parks, Recreation and Tourism Management.

207 Practicum II 1(0,3) Continuation of PRTM 206. Experience will be gained in a leisure situation different from the PRTM 206 exposure. A minimum of 90 hours with a leisure agency and approved by the University is required. To be taken Pass/Fail only. *Preq:* PRTM 205, Sophomore standing in Parks, Recreation and Tourism Management.

209 (FOR) Forest and Recreation Resources Application of the Microcomputer 3(2,3) Undergradute students in Parks, Recreation and Tourism Management will become familiar with microcomputers and software packages: word processing, spreadsheet, database management, and presentation graphics. *Preq:* CP SC 120 and Forestry or Parks, Recreation and Tourism major.

254 Sports in Recreation 3(2,3) Administrative and supervisory skills indigenous to public and/or private agency athletic programs are considered. Group instruction is given to individual and team sports, and officiating techniques applicable to these sports are taught.

270 Introduction to Recreation Resources Management 3(3,0) Fundamentals of recreation resources management are presented to include the framework of management, management of specific resources, management of visitors, and management of services.

301 Recreation and Society 3(3,0) The role of recreation in a technological and work-oriented society is investigated. Particular emphasis will be placed on recreation behavior, resources, and programming in public and private organizations which serve the public wants. Not open to students who have completed PRTM 101 and 102.

305 Safety and Risk Management in Parks, Recreation and Tourism Management 3 (3,0) Provisions of safe services, facilities and activities in the parks, recreation and tourism domain will be studied through the application of germane concepts from the areas of safety, risk management, and liability. *Preq:* PRTM 321. *Coreq:* Junior standing.

307 Facility Operations and Maintenance 3(2,3) Maintenance techniques and materials. Job planning and scheduling problems of overuse and preventive maintenance are included.

308, H308 Leadership and Group Processes in Recreation 3(3,0) Leadership is analyzed through experience-based learning. Various styles of leadership and communication and their probable consequences are examined. Techniques for planning of large and small group meetings are considered. Examination is made of literature in the field of leadership and group processes.

309 Behavioral Concepts in Parks, Recreation and Tourism 3(3,0) Studies social psychological concepts concerning leisure behavior in various types of park, recreation, and tourism settings. Students will learn to apply those theories and behavioral concepts required to understand and manage leisure activities and environments. *Preq:* PRTM 101 or consent of instructor; SOC 201 or PSYCH 201.

311, H311 Therapeutic Recreation 3(3,0) Examination of the profession of therapeutic recreation by analyzing the history, philosophy, concepts, roles, and functions involved in the therapeutic recreation services.

314 Therapeutic Recreation Interventions I 1(0,3) Experiential examination of program interventions used with mental health, chemically dependent, and related populations. *Preq:* PRTM 101.

315 Therapeutic Recreation Interventions II 1(0,3) Experiential examination of program interventions used with physically disabled and other populations. *Preq:* PRTM 314.

316 Therapeutic Recreation Processes 3(3,0) Examination of principles and procedures applicable to client assessment, activity analysis, goal identification, treatment planning, documentation, and evaluation in therapeutic recreation. *Preq:* PRTM 311.

318 Leisure Lifestyle Management 3(3,0) Course examines principles and techniques applicable to guiding disabled as well as nondisabled individuals in an exploration of leisure needs, barriers, consequences, and accessibility.

320, H320 Recreation Policymaking 3(3,0) Structures and processes for public park and/or recreation policy formation in the United States.

321, H321 Recreation Administration 3(3,0) An analysis of the internal organization of a recreation department dealing with finances and accounting, records and reports, publicity and public relations, state and federal legislation, staff organization, coordination of community resources. *Preq:* Junior standing.

330, H330 Visitor Services and Interpretation 3(3,0) An introduction to the philosophy and principles of the art of environmental interpretation. A comprehensive survey of interpretive theory as it applies to the recreation and parks practitioner and the varying settings within the profession.

342, H342 Introduction to Tourism 3(3,0) Survey of travel and tourism in the United States with focus on terminology, demographics, financial significance, and trends.

343 Spatial Aspects of Tourist Behavior 3(3,0) Spatial patterns of national and international leisure travel destinations are explored and analyzed regarding their tourism attractiveness.

344 Tourism Markets and Supply 3(3,0) Course will acquaint students with the principles of matching tourism markets and supply. Students will examine the strategies used in developing markets.

349 Survey of Tourism Sites 1(0,3) On-site study of various exemplary components of the travel and tourism industry in the southeast. There will be additional costs to students to cover the travel portion of this course. *Preq:* PRTM 342; Junior standing in Parks, Recreation and Tourism Management or consent of instructor.

352 Camp Organization and Administration 3(2,3) Surveys the development and trends of camping in America. Considers programming for the operations of agency and private camps. Enables students to master the techniques of group living. Laboratory offers practical experience in camp craft including trips and outdoor cooking.

390 Independent Study in Parks, Recreation, and Tourism Management 1(1,0) Comprehensive studies and investigation of special topics not covered in other courses. Emphasis will be placed on field studies, community service and independent readings. May be repeated for a maximum of 3 credits. *Preq:* Junior standing and consent of instructor.

391 Selected Topics in Parks, Recreation, and Tourism Management 2-3(2-3,0) Presents an in-depth examination of developing trends in parks, recreation, and tourism that warrants timely study. May be repeated twice for a maximum of 6 credits, but only if a different topic is covered. *Preq:* Junior standing in Parks, Recreation and Tourism Management.

400, 600 Supervision of Recreation Personnel Patterns and Processes 3(3,0) A comprehensive study of the supervisory process in relation to individuals, programs, and groups in recreation agencies.

401, 601 World Geography of Recreation and Parks 3(3,0) Major international patterns in the provision and use of urban and rural parks and recreation are examined.

403 Elements of Recreation and Park Planning 3(3,0) Basic recreation and park planning principles, processes and trends in area and facility development combine to form the basis for formulation of a relevant knowledge of planning. *Preq:* Senior standing.

404 Field Training I 1(1,0) Preparation for the field training experience including topics such as resume development, interviewing techniques, internship agency selections, and responsibilities of the student, department, and agency. To be taken Pass/Fail only. *Preq:* PRTM 206, 207, and consent of instructor.

405 Field Training II 7(0,21) In a minimum ten-week program, the student has the opportunity to observe and be involved with operational programs. The student will have the responsibilities of organizing and implementing activities and events under supervision within a chosen agency. A minimum of 360 hours is required. To be taken Pass/Fail only. *Preq:* PRTM 404; Senior standing in Parks, Recreation and Tourism Management; grade-point equivalent to Clemson University graduation requirement; consent of instructor.

406 Senior Seminar 1(1,0) Examination of current community recreation, resource management, therapeutic recreation, and tourism management topics that allows senior Parks, Recreation and Tourism Management students the opportunity to relate their academic studies to the latest problems, changes, and trends in the field. *Preq:* Senior standing in Parks, Recreation and Tourism Management.

409 Methods of Recreation Research I 3(3,0) An analysis of the principle methods of recreation research, the application of descriptive statistics to recreation research, and the development of a research proposal. *Preq:* Senior standing.

410, H410 Methods of Recreation Research II 3(3,0) A continuation of PRTM 409 to include the supervised execution and reporting of results of the research proposal developed in PRTM 409 and the application of inferential statistics to research. *Preq:* PRTM 409 or consent of instructor.

411, H411, 611 Therapeutic Recreation for Selected Populations 3(2,3) Therapeutic recreation services for the developmentally disabled person and youth and adult corrections populations. Emphasis is directed to planning and implementation of therapeutic recreation services to the needs of clients and the goals of agencies and institutions.

412, H412, 612 Therapeutic Recreation and Mental Health 3(3,0) Therapeutic recreation services in mental health clinics, institutions, and outdoor settings. Review of disorders and current modes of treatment as they relate to therapeutic recreation. *Preq:* PRTM 311 or consent of instructor.

413, 613 Therapeutic Recreation for Physically Disabled 3(2,3) Examination of the potential psychological, physical, and sociological implications of disability to the individual and to the planning and directing of therapeutic recreation services. *Preq:* PRTM 311 or consent of instructor.

414, 614 (ED) Recreation and Leisure for Special Populations 3(3,0) Course designed to provide class participants with practical experience in designing recreation and leisure activities for special populations (e.g., handicapped, elderly).

416 Leisure and Aging 3(3,0) Examines the role of leisure services in later life, the needs of community-based and institutionalized elderly, and the development of service-delivery systems to meet those needs.

421, H421, 621 Recreation Financial Resources Management 3(3,0) Analysis of recreation financial resources management. Deals with revenue sources and their allocation. *Preq:* PRTM 321 and Senior standing in Parks, Recreation and Tourism Management.

431, 631 Methods of Environmental Interpretation 3(2,3) Practice and instruction in the use of equipment and methods available to the interpreter in public contact work. Coaching in presentation and evaluation of live programs and in design, execution, and evaluation of mediated programs will be the major emphasis. Programs will be delivered to public audiences in the Clemson area. *Preq:* PRTM 330; Senior standing in Parks, Recreation and Tourism Management; or consent of instructor.

441, 641 Commercial Recreation 3(3,0) Components of offering leisure services and products to the public by individuals, partnerships, and corporations for the purpose of making a profit.

443, 643 Resorts in National and International Tourism 3(3,0) A variety of resort types are studied with respect to their development, organization, visitor characteristics, and environmental consequences. A case-study approach is used.

444, 644 Tour Planning and Operations 3(3,0) Provides the opportunity to understand the psychology of touring, with emphasis on a packaged and group tours, and how tours of different types and scale are planned, organized, marketed, and operated. *Preq:* PRTM 342 or consent of instructor.

445, 645 Conference/Convention Planning and Management 3(3,0) Provides the opportunity to understand the problems of and solutions to conference and convention planning and management from both the sponsoring organization and facility manager's perspectives.

446, 646 Community Tourism Development 3(3,0) Provides a community-based perspective of the organizational, planning, development and operational needs for a suc-

cessful tourism economy at the local level. *Preq:* PRTM 342 or consent of instructor.

447, 647 Perspectives on International Travel 3(3,0) Using the United States as a destination, international travel patterns and major attractions are presented. Factors which restrain foreign travel to the United States are analyzed. *Preq:* Senior standing and reading knowledge of a foreign language or consent of instructor.

448, 648 Microorganization of the Tourism Industry 3(3,0) Systematic on-sight study of the organization, structure, and operation of the tourism industry at a micro level. *Preq:* Junior standing and consent of instructor.

449, 649 Tourism and Regional Development 3(3,0) Onsite investigation of tourism development as it relates to other aspects of regional economic, social, and natural resource development. *Preq:* Junior standing and consent of instructor.

452, 652 Campus Recreation 3(3,0) Study of the basic components required for administration of successful college union and intramural-recreation sport programs.

472, 672 Historic Site Interpretation 3(3,0) The development and implementation of the specialized interpretive programs required at historic sites. An overview of the historic movement in the United States and its presentation to the American people. *Preq:* PRTM 330.

473, 673 Introduction to Museology 3(2,3) An introduction to the museum concept with insight into current museum practices. Course will include principles and methods of museum practice including conservation/restoration techniques. *Preq:* PRTM 330.

474, H474 Advanced Recreation Resources Management 3(3,0) Advanced topics in recreation resource management focusing on management strategies and techniques for addressing common resource and social problems in recreation resource management. Case studies and problem analysis will be emphasized. *Preq:* Senior standing or consent of instructor.

701 Foundations of Parks, Recreation, and Tourism Management 2(2,0)

705 Internship 1-3(0,9)

706 Computer Assisted Administration in Leisure Services 3(2,3)

707 Principles of Environmental Interpretation 3(3,0)

708 Independent Study 1-3(1-3,0)

709 Special Problems 1-3(1-3,0)

710 Current Issues in Recreation 1(1,0)

801 Philosophical Foundations of Recreation and Park Administration 3(3,0)

802 Group Processes in Leisure Services 3(3,0)

803 Seminar in Recreation and Park Administration 3(3,0)

804 Comprehensive Recreation Planning 3(3,0)

805 Recreational Aspects of Water Resources 3(3,0)

806 Urban Recreation Analysis 3(3,0)

807 Recreation Behavior in Natural Environments 3(3,0)

808 Behavioral Aspects of Parks, Recreation, and Tourism Management 3(3,0)

811 Research Methods in Parks, Recreation, and Tourism Management 3(3,0)

812 Leisure Services for the Elderly 3(3,0)

815 Therapeutic Recreation and Activity Therapy Administration 3(3,0)

820 Recreation Resource Policy Issues and Processes 3(3,0)

840 Tourism Planning 3(3,0)

841 Seminar in Exposition Management 3(3,0)

843 Tourism Analysis 3(3,0)

891 Master's Research. Credit to be arranged.

900 Selected Topics 1-3(1-3,0)

908 Advanced Topics 1-3(1-3,0)

910 Research Seminar 1(1,0)

991 Doctoral Research. Credit to be arranged.

PHILOSOPHY (PHIL)

Professor: S. Silvers, *Head; Associate Professors:* W. A. Maker, S. A. Satris; *Assistant Professors:* M. A. Martin, J. L. McCollough, T. G. May, T. J. Oberdan, D. E. Wueste; *Visiting Assistant Professor:* W. B. Boon

101, H101 Introduction to Philosophic Problems 3(3,0) A discussion of representative philosophical questions which arise from human thought and action. Characteristic topics are as follows: values, knowledge, human nature, and society.

102, H102 Introduction to Logic 3(3,0) Introduction to methods of evaluating arguments. Simple valid argument forms are given which can be joined together to produce the logical form of virtually any argument. Informal fallacies may also be considered.

103 Introduction to Ethics 3(3,0) Philosophical consideration of the nature of ethics, basic ethical issues, and problems and modes of ethical reasoning.

303 Philosophy of Religion 3(3,0) A critical consideration of the meaning and justification of religious beliefs. Representative topics are as follows: The Nature and Existence of God; Religious Knowledge; Religious Language; The Problem of Evil.

304 Moral Philosophy 3(3,0) A study of moral problems, their origin in conflicts between duty and desire, and alternative solutions proposed by classical and contemporary writers.

315 Ancient Philosophy 3(3,0) Origins and development of rationality as found in the thought of selected philosophers, such as Socrates, Plato, and Aristotle.

316 Modern Philosophy 3(3,0) Development of the modern view as seen in major Western philosophers of the 16th, 17th, and 18th centuries. The thought of Descartes, Spinoza, Leibniz, Locke, Berkeley, and Hume may be considered to illustrate the development of rationalism and empiricism.

317 Nineteenth-Century Philosophy 3(3,0) Development of 19th-century philosophy with emphasis on selected works of philosophers such as Kant, Hegel, Marx, Nietzsche, and Kierkegaard.

318 Twentieth-Century Philosophy 3(3,0) Study of the dominant movements in Western philosophy today, particularly existentialism and analytical philosophy. The object is to acquire sufficient background for reading current philosophical or philosophically-influenced literature.

320 Social and Political Philosophy 3(3,0) Critical consideration of the views of some major philosophers on the nature of the individual's relation to society and the state in the context of their wider philosophical (logical, epistemological, metaphysical, and ethical) doctrines. Philosophers examined may include Plato, Aristotle, Augustine, Hobbes, Rousseau, Mill, Marx, Hegel, Rawls, and Nozick.

323 Theory of Knowledge 3(3,0) Examination of concepts, criteria, and decision procedures underlying rational belief and the justification of knowledge claims. Representative answers to the problem of skepticism are considered, with special attention to some leading theories of knowledge.

324 Philosophy of Technology 3(3,0) This course will examine technology and representative philosophical assessments of it with a focus on understanding its impact on the human condition.

325 Philosophy of Science 3(3,0) Philosophical study of problems generated by science, but which are not themselves scientific, such as what comprises a scientific theory; how scientists formulate theories and acquire knowledge; what, if anything, differentiates science from other ways of knowing; what role concepts play in scientific knowledge; and whether scientific progress is rational.

326 Science and Values 3(3,0) Examination of several features of the relation between science and values. Topics may include the following: the ethical and social obliga-

tions of scientists, the role of value judgements in scientific practice, and the influence of social and political values on science and scientists.

330 Contemporary Issues in Philosophy 3(3,0) Examination of a variety of issues of broad concern to philosophers today. Issues may vary. With departmental consent, course may be repeated one time for credit.

333 Metaphysics 3(3,0) Examination of issues and problems concerning the ultimate nature of reality. Topics may include the appearance/reality distinction, the nature of existence, freedom and determinism, personal identity, idealism and realism.

335 Philosophy and Film 3(3,0) Introduction to philosophical thought about film, the study of films, and theoretical and critical writing about films. Both philosophical problems about the nature of film and philosophical problems exhibited in films will be considered.

343 Philosophy of Law 3(3,0) Explanation of the nature of legal theory and the law through a critical examination of the basic concepts and principles of these fields.

344, H344 Business Ethics 3(3,0) Study of ethical issues created by business activities, relating them to fundamental questions of ethics generally. Representative topics: hiring, firing, promotions, business and minorities, organizational influence in private lives, consumer interests, economic justice, and reindustrialization.

345 Environmental Ethics 3(3,0) Study of ethical problems in our dealings with the rest of nature, and of how they relate to ethics in general. Representative topics: the basis of ethics, nature and intrinsic value, duties to future generations, economics and the environment, rare species, animal rights, ethics and agriculture, energy doctrine.

350 (NURS) Technology and Philosophy in Nursing 3(3,0) See NURS 350.

355 Philosophy of Mind and Cognitive Science 3(3,0) Critical examination of philosophical and scientific theories of mental phenomena and of the relationship between mental and material phenomena. Theories of Mind-Body Dualism, Monism, Functionalism, Eliminative and Reductive Materialism, Connectionism, and the status of folk psychology versus cognitive neuroscience will be studied.

360 Symbolic Logic 3(3,0) Introduction to the basic concepts of modern symbolic logic, including the symbolization of statements and arguments and the techniques of formal proof.

365 Philosophy of Language 3(3,0) Examination of issues within and theories about language and its place in philosophical discussion, including such questions as the nature of meaning, the role of symbols in thought, the concept of truth, and the structure of language.

401, 601 Studies in the History of Philosophy 3(3,3)[1] Indepth study of a selected philosopher, philosophical school, or movement. Topics will vary. With departmental consent may be repeated one time for credit. *Preq:* Consent of instructor.

402, 602 Topics in Philosophy 3(3,3)[1] A thorough examination of a particular philosophical topic, issue, or problem. Topics will vary. With departmental consent, course may be repeated one time for credit. *Preq:* Consent of instructor.

499 Independent Study 1-3(1-3,0) Course of study designed by the student in consultation with a faculty member who agrees to provide guidance, discussion, and evaluation of the project. The student must select and confer with the faculty member early enough for their plan to be approved by the department head prior to registration. *Preq:* Consent of instructor.

PHYSICAL SCIENCE (PH SC)

107 Introduction to Earth Science 4(3,3) Survey of topics in geology, meteorology, astronomy, and oceanography emphasizing comprehension and practical application of earth science concepts to experiments and activities appropriate for the elementary school classroom. Enrollment preference given to Early Childhood and Elementary Education majors.

108 Introduction to Physical Science 4(3,3) Survey of topics in chemistry and physics

[1]Current topics and course descriptions available in the department's course-offering brochure.

emphasizing comprehension and practical application of physical science concepts to experiments and activities appropriate for the elementary school classroom. Enrollment preference given to Early Childhood and Elementary Education majors. *Preq:* PH SC 107.

PHYSICS (PHYS)

Professors: P. B. Burt, D. D. Clayton, H. W. Graben, F. J. Keller, L. L. Larcom, M. F. Larsen, P. J. McNulty, *Head;* J. R. Manson, J. R. Ray, M. D. Sherrill, R. C. Turner, C. W. Ulbrich; *Associate Professors:* T. F. Collins, P. J. Flower, J. A. Gilreath, J. W. Meriwether, Jr., P. A. Steiner, G. X. Tessema; *Assistant Professors:* D. H. Hartmann, M. D. Leising, B. S. Meyer; *Lecturer:* R. N. Jeanes; *Visiting Associate Professors:* D. D. Moyle, D. R. Overcash, J. L. Reid; *Visiting Assistant Professor:* S. S. El-Teleaty; *Adjunct Professor:* L. M. Duncan III

101 Current Topics in Modern Physics 1(0,2) Demonstrations and lectures serving as an introduction to different areas of physics and astronomy will be presented by various members of the staff. These areas may include such topics as astrophysics, energy, relativity, and weather, as well as visits to the planetarium.

122, H122 Physics with Calculus I 3(3,0)[1] The first of three courses in a calculus-based physics sequence. Topics include vectors, laws of motion, conservation principles, rotational motion, oscillations, and gravitation. *Coreq:* MTHSC 108.

124 Physics Laboratory I 1(0,3) Introduction to physical experimentation with emphasis on mechanical systems, including oscillatory motion and resonance. Computers are used in the experimental measurements and in the statistical treatment of data. *Coreq:* PHYS 122.

200 Introductory Physics 4(3,2)[1] Introduction to classical physics. Includes elements of mechanics, heat, electricity, and light. This course may not be substituted for PHYS 122 but may be substituted for PHYS 207, only with the approval of the Department of Physics and Astronomy. *Coreq:* MTHSC 105 or equivalent.

207 General Physics I 4(3,2)[1] Introductory course for students who are not majoring in physical science or engineering. This course covers such topics as mechanics, waves, fluids, and heat. *Coreq:* A course that includes algebra and trigonometry.

208 General Physics II 4(3,2)[2] Continuation of PHYS 207. This course covers such topics as electricity, magnetism, electromagnetic waves, optics, and modern physics. *Preq:* PHYS 207.

221, H221 Physics with Calculus II 3(3,0)[2] Continuation of PHYS 122. Topics include thermodynamics, kinetic theory of gases, electric and magnetic fields, electric currents and circuits, and motions of charged particles in fields. *Preq:* PHYS 122.

222, H222 Physics with Calculus III 3(3,0) Continuation of PHYS 221. Topics include wave motion, electromagnetic waves, interference and diffraction, relativity, atomic particles, and atomic and nuclear structure. *Preq:* PHYS 221.

223 Physics Laboratory II 1(0,3) Experiments in heat and thermodynamics, electrostatics, circuits, and magnetism. Computers are used in the statistical treatment of data. *Coreq:* PHYS 221.

224 Physics Laboratory III 1(0,3) Experiments involve atomic, molecular, and nuclear systems. The wave particle dualism of light and matter is emphasized. Calculators and computers are used in statistical treatment of data. *Coreq:* PHYS 222.

240 Physics of the Weather 3(3,0) A descriptive introduction to meteorology. Includes atmospheric thermodynamics, solar radiation, heat budget, atmospheric circulation, force laws governing air motion, fronts, precipitation, synoptic prediction. Special topics of current interest such as the effect of environmental pollution on weather, and the effect of weather on health are included.

262 Physics of Music 3(3,0) An elementary, nontechnical study of the relationship between the laws of physics and the production of music for the music student or layman

[1]Credit for a degree will be given for only one of the following courses: PHYS 122, 200, 207.
[2]Credit for a degree will be given for only one of the following courses: PHYS 208, 221.

who wishes to understand the physical principles of the art. Topics include mechanical and acoustical laws, harmonic analysis, musical scales, sound production in instruments, physiology of hearing, etc.

290 Physics Research 1-3(0,3-9) This individual research project may be performed in any area of experimental or theoretical physics or astronomy. Work will be performed under the supervision of a physics or astronomy faculty member. Project need not be original but must add to the student's ability to carry out research. May be repeated for a maximum of 6 credits. *Preq:* Consent of instructor and minimum GPR of 3.0.

321, H321, 621 Mechanics I 3(3,0) Statics, motions of particles and rigid bodies, vibratory motion, gravitation, properties of matter, flow of fluids. *Preq:* PHYS 221.

322, H322, 622 Mechanics II 3(3,0) Dynamics of particles and rigid bodies, Lagrangian and Hamiltonian formulations, vibrations of strings, wave propagation. *Preq:* PHYS 321 or consent of instructor.

325, H325, 625 Experimental Physics I 3(1,4) Introduction to experimental modern physics, measurement of fundamental constants, repetition of crucial experiments of modern physics (Stern-Gerlach, Zeeman effect, photoelectric effect, etc.). *Coreq:* PHYS 321 or consent of instructor.

326, H326, 626 Experimental Physics II 3(1,4) Continuation of PHYS 325.

355, H355 Modern Physics 3(3,0) A study of the topics of modern physics, including relativity, atomic physics, quantum mechanics, condensed-matter physics, nuclear physics, and elementary particles. *Preq:* PHYS 222, MTHSC 206.

401 Senior Thesis I 1-3 A semioriginal project performed under the direction of a physics faculty member. Theoretical fields available include relativity, solid state, statistical mechanics, nuclear physics, and astrophysics. Experimental work may be done in various areas of solid-state physics, astronomy, biophysics, and atmospheric physics. *Preq:* Three physics courses beyond introductory physics.

402 Senior Thesis II 1-3 Continuation of PHYS 401.

417, H417, 617 Introduction to Biophysics I 3(3,0) Introduction to the application of physics to biological problems. Topics include a review of elementary chemical and biological principles, physics of biological molecules, and fundamentals of radiation biophysics. *Preq:* MTHSC 206, PHYS 221, or consent of instructor.

420, 620 Atmospheric Physics 3(3,0) A study of the physical processes governing atmospheric phenomena. Topics include thermodynamics of dry and moist air, solar and terrestrial radiative processes, convection and cloud physics, precipitation processes, hydrodynamic equations of motion and large-scale motion of the atmosphere, numerical weather prediction, atmospheric electricity. *Preq:* MTHSC 108, PHYS 208 or 221.

432, H432, 632 Optics 3(3,0) This course covers a selection of topics, depending on the interest of the student. Topics covered may include the formation of images by lenses and mirrors, design of optical instruments, electromagnetic wave propagation, interference, diffraction, optical activity, lasers, and holography. *Preq:* PHYS 221.

441, H441, 641 Electromagnetics I 3(3,0) Study of the foundations of electromagnetic theory. Topics include electric fields, electric potential, dielectrics, electric circuits, solution of electrostatic boundary-value problems, magnetic fields, and magnetostatics. *Preq:* PHYS 221 and MTHSC 208, or consent of instructor.

442, H442, 642 Electromagnetics II 3(3,0) Continuation of PHYS 441. Study of the foundations of electromagnetic theory. Topics include magnetic properties of matter, microscopic theory of magnetization, electromagnetic induction, magnetic energy, AC circuits, Maxwell's equations, and propagation of electromagnetic waves. Other topics may include waves in bounded media, antennas, electrodynamics, special theory of relativity, and plasma physics. *Preq:* PHYS 441 or consent of instructor.

446, H446, 646 Solid State Physics 3(3,0) An introductory treatment of the crystal structure of solids and the properties of solids which depend on crystal structure, free electron model of metals, band theory of solids, Brillouin zones, crystalline defects, and diffusion. *Preq:* PHYS 222 or consent of instructor.

452, H452, 652 Nuclear and Particle Physics 3(3,0) Study of our present knowledge con-

cerning subatomic matter. The experimental results are stressed. Topics discussed include particle spectra, detection techniques, Regge pole analysis, quark models, proton structure, nuclear structure, scattering and reactions.

455, H455, 655 Quantum Physics I 3(3,0) Discussion of solution of the Schroedinger equation for free particles, the hydrogen atom and the harmonic oscillator. *Preq:* PHYS 322 and 441, or consent of instructor.

456, H456, 656 Quantum Physics II 3(3,0) Continuation of PHYS 455. Application of principles of quantum mechanics as developed in PHYS 455 to atomic, molecular, solid state and nuclear systems. *Preq:* PHYS 455.

457, H457, 657 Basic Health and Radiological Physics I 3(3,0) Topics discussed in this course include a survey of nuclear physics, interaction of radiation with matter, biological effects of high and low energy radiation, and uses of radiation for therapy and diagnosis. *Preq:* PHYS 321 and 441 or consent of instructor.

458, H458, 658 Basic Health and Radiological Physics II 3(3,0) Continuation of PHYS 457. Topics covered will include dosimetry and radiation protection, ultraviolet radiation effects, shielding calculations, thermal effects, tracer use and kinetics, and ultrasonics. *Preq:* PHYS 457 or equivalent.

465, H465, 665 Thermodynamics and Statistical Mechanics 3(3,0) Study of temperature development of the laws of thermodynamics and their application to thermodynamic systems. An introduction to low temperature physics is given. *Preq:* Six hours of physics beyond PHYS 222 or consent of instructor.

475, 675 Selected Topics 1-3(0-3,0-9) Comprehensive study of a topic of current interest in the field of physics. May be taken for a maximum of 6 credits, but only if a different topic is covered. *Preq:* Consent of instructor.

710 Selected Topics for Teachers 1-6(0-6,0-18)

811 Methods of Theoretical Physics I 3(3,0)

812 Methods of Theoretical Physics II 3(3,0)

815 (M E) Statistical Thermodynamics I 3(3,0)

816 Statistical Thermodynamics II 3(3,0)

817 Advanced Statistical Mechanics 3(3,0)

821 Classical Mechanics I 3(3,0)

822 Classical Mechanics II 3(3,0)

841 Electrodynamics I 3(3,0)

842 Electrodynamics II 3(3,0)

845 Solid State Physics I 3(3,0)

846 Solid State Physics II 3(3,0)

852 Radiation Physics 3(3,0)

875 Selected Topics 1-3(1-3,0)

890 Directed Activities in Applied Physics 1-6

891 Master's Research. Credit to be arranged.

951 Quantum Mechanics I 3(3,0)

952 Quantum Mechanics II 3(3,0)

966 Relativity 3(3,0)

971 Advanced Quantum Theory I 3(3,0)

972 Advanced Quantum Theory II 3(3,0)

991 Doctoral Research. Credit to be arranged.

PLANNING STUDIES (C R P)

Professors: J. R. Caban, *Head;* B. C. Nocks; *Associate Professor:* J. B. London; *Assistant Professor:* K. R. Brooks; *Visiting Assistant Professors:* R. W. Bainbridge, C.

Cowan-Ricks; *Adjunct Professor:* E. L. Falk; *Adjunct Associate Professor:* J. M. Williams

405, 605 Urban Genesis and Form 3(3,0) This course is intended to familiarize professional students in the environmental design disciplines concerning the origin, development, and growth of cities to enable them to understand the ever accelerating growth of urbanism and increasing complexity or urban organism. *Preq:* Consent of instructor or department head.

411, 611 Introduction to City and Regional Planning 3(3,0) The purpose of the course is to introduce students from a variety of disciplines to City and Regional Planning. Spatial and nonspatial areas of discipline are explored through a wide ranging lecture/seminar program. *Preq:* Consent of instructor or department head.

415, 615 Small City and Rural Planning 3(3,0) Examines current and future aspects and challenges of small urban centers and rural areas. Course may focus on a wide range of subjects—design, economic, social, political, physical, natural resources, and environmental—depending on the emphasis at the time.

472, 672 Planning Process and Administration 3(3,0) Course outlines a conceptual framework of planning organizations and tools used in the planning process; potentials of planning and management approaches that address the relationship and integration between techniques and instruments. *Preq:* Consent of instructor.

473, 673 Government and Planning Law 3(3,0) Complete coverage of the laws and ordinances relating to redevelopment, subdivision control, zoning, official mapping, and other topics including interpretation, philosophy, enabling legislation and model ordinances. The legal basis of current and long-range planning policy is discussed. *Preq:* Consent of instructor or department head.

483, 683 Seminar on Planning Communication 3(3,0) Informal means open for plan implementation. The organization of effective public information and education programs, use of citizen advisory committees, and application of other implementation techniques. *Preq:* Consent of instructor or department head.

812 City and Regional Planning Theory 3(3,0)

822 Urban Systems and Design 3(3,0)

823 Social Planning and Delivery Systems 3(3,0)

831 Physical Planning Studio 3(3,0)

832 Problems in Site Planning 3(1,2)

834 Geographic Information Systems for City and Regional Planning 3(3,0)

835 Advanced Topics in Geographic Information Systems 3(3,0)

840 Seminar in Coastal Planning 3(3,0)

841 Seminar in Environmental Planning 3(3,0)

853 Planning Methods I: Theory and Technique 3(0,9)

854 Planning Methods II: Techniques and Applications 3(0,9)

858 Research Methods and Planning Thesis Proposal 3(0,9)

859 Planning Terminal Project 3(0,9)

860 Planning Studio 3-6(0,9-18)

863 Urban and Metropolitan Planning Studies Studio 3-6(0,9-18)

865 Advanced Land Use and Built Form Studies Studio 3-9(0,9-27)

866 Comprehensive Planning Studio 6(3,9)

871 Growth Management and Legal Issues 3(3,0)

872 Housing Issues in the United States 3(3,0)

881 Quantitative Methods and Urban Planning Policy 3(3,0)

882 Seminar in Mathematical Modeling for Urban and Regional Planning 3(3,0)

883 Techniques for Analyzing Development Impacts 3(0,9)

884 Public Services and Facilities Planning 3(3,0)

889 Selected Topics in Planning 3(3,0)

890 Directed Studies in City and Regional Planning 1-6(0,3-18)

891 Planning Thesis 3-9

893 City and Regional Planning Internship 3-6(0,3-18)

PLANT PATHOLOGY (PL PA)

Professors: N. D. Camper, O. J. Dickerson, *Head;* G. C. Kingsland, S. A. Lewis, S. W. Scott, E. I. Zehr; *Assistant Professors:* R. A. Dean, D. A. Kluepfel

101, H101 Introduction to Plant Diseases 2(2,0)F Introduction to diseases of plants, their causes, methods of spread, development in plants, effects on plants, and impact on mankind.

102, H102 Introduction to Plant Pathology Research 1-3(0,3-9) Introduction to research by participation in a plant pathology research project. The student will be guided in preparation of a proposal, completion of its objectives, interpretation of data, and composition of a final report. To be taken Pass/Fail. *Preq:* PL PA 101 or consent of instructor.

302, H302 Plant Pathology Research 1-3(0,3-9) Research experience in a plant pathology research project for an undergraduate who understands basic concepts of research. Students will develop research objectives, procedures, and collect data. A written report will include interpretation of results. To be taken Pass/Fail. *Preq:* Consent of instructor.

401, H401, 601 Plant Pathology 3(2,2) Interrelationships between fungi, nematodes, bacteria, viruses, and mycoplasmas as causal agents of plant diseases, their hosts, and the environment. Diseases caused by abiotic factors, symptom development, diagnosis, economics, control, and relationship of plant diseases to human welfare will be studied using examples of economically important diseases. *Preq:* BIOL 103, 104 or equivalents.

402, H402, 602 (ENT) Diseases of Ornamental Plants 3(2,2)S Survival mechanisms, life cycles, host-parasite relationships, symptomatology, diagnosis, economics and integrated control of infectious diseases; and causal factors, diagnosis and control strategies of noninfectious diseases of ornamental plants. *Preq:* PL PA 401 or equivalent.

406, H406, 606 (ENT) Diseases and Insects of Turfgrasses 3(2,2) Host-parasite relationships, symptomatology, diagnosis, economics, and control of infectious and noninfectious diseases of turfgrasses; life histories, diagnosis, and control of important insect pests of turfgrasses. *Preq:* ENT 301 and PL PA 401 or equivalents.

411, 611 Plant Disease Diagnosis I 2(1,2)SS Odd-numbered years. Methods and procedures used in the diagnosis of plant diseases, especially late spring and early summer diseases. Basic techniques of pure culture and identification of plant pathogens and Koch's postulates will be taught. Diagnosis of a wide variety of diseases of cultivated and wild plants will be carried out. *Preq:* PL PA 401 or equivalent.

412, 612 Plant Disease Diagnosis II 2(1,2)SS Even-numbered years. Methods and procedures used in the diagnosis of plant diseases, especially late-summer diseases. Basic techniques of pure culture and identification of plant pathogens and Koch's postulates will be taught. Diagnosis of a wide variety of diseases of wild and cultivated plants. *Preq:* PL PA 401 or equivalent.

451, 651 Bacterial Plant Pathogens 3(2,3)F Odd-numbered years. The nature, development, and control of plant diseases caused by bacteria. Taxonomic considerations, host-parasite relations and techniques used in isolating, identifying, and preserving bacterial plant pathogens. *Preq:* MICRO 305, PL PA 401, or consent of instructor.

456, H456, 656 Plant Virology 3(2,3)S Even-numbered years. Plant viruses with emphasis on their morphology, biochemistry, purification and transmission; symptoms resulting from virus infection; virus-vector relationships; and serological procedures. The importance and control of plant virus diseases will be discussed. *Preq:* BIOL 103 and any biochemistry or plant physiology course.

458, H458, 658 Plant Parasitic Nematodes 3(2,3)F Even-numbered years. Morphology and taxonomy of stylet-bearing nematodes and their relationship with plant diseases. *Preq:* BIOL 103, 104 or 110, 111.

800 Advanced Plant Pathology 3(3,0)

801 Epidemiology and Control of Plant Disease 3(3,0)

802 Selected Topics 1-3(1-3, 0-6)

803 Fungal Plant Pathogens 3(1,6)

804 Physiological Plant Pathology 3(3,0)

805 Special Problems in Plant Pathology 1-3

807 Seminar 1(1,0)

809 Physiological Techniques in Plant Pathology 2(1,3)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

PLANT PHYSIOLOGY (PL PH)

991 Doctoral Research. Credit to be arranged.

POLITICAL SCIENCE (PO SC)

Professors: C. W. Dunn, M. A. Morris, T. G. O'Rourke, *Head*; W. H. Owens, Jr., M. W. Slann; *Associate Professors:* L. L. Duke, W. Lasser, J. D. Woodard; *Assistant Professors:* C. Cirincione, Jr., L. Xiang; *Visiting Assistant Professor:* T. R. Graben

101, H101 Introduction to American Politics 3(3,0) Introduction to American National Government and politics with an emphasis on the functions of governmental organizations, the behavior of political parties and personalities, and the role of public opinion.

103 Introduction to Government and Politics 3(3,0) Introduction to the study, analysis, scope, and sources of government. Emphasis is given to the comparative institutions of government, theoretical conceptions people have entertained about government, and analysis of the ways in which people have behaved in response to government.

105, H105 Introduction to International Politics 3(3,0) Introduction to international politics, with an emphasis on a survey of the politics of the major world regions; America's role in world affairs; and selected current international issues and problems.

302 State and Local Government 3(3,0) The structural features, functions, and legislative, executive and judicial processes of American state and local government.

310 Special Activities 1-3(1-3,0) Course encompasses special projects, approved by the department head, which involve students in research, simulation, internships, or other actions requiring the study and application of political principles, and which are engaged in for at least one semester or its equivalent.

311 Model United Nations 1(0,1) Participation in United Nations simulation exercises, in competition with other colleges and universities.

312 State Student Legislature 1(0,1) Participation in state student legislature simulation exercises, in competition with other colleges and universities in the State.

321 General Public Administration 3(3,0) Introduction to public administration including the elements of organization, personnel and financial management, administrative law, and administrative responsibility. *Preq:* PO SC 101, Junior standing, or consent of instructor.

341 Political Science Research Methods 3(3,1) Introduction to political research, with emphasis on quantitative methods of analysis. Topics include research design, measurement, data collection, sampling, procedures and applications of statistical techniques to research problems in political science. Laboratory stresses computer use for elementary data analysis. *Preq:* MTHSC 101 and PO SC 101 or equivalent or consent of instructor.

351 Classical Political Thought 3(3,0) Political philosophy from the pre-Socratic period to Machiavelli. *Preq:* PO SC 103 or 105.

352 Modern Political Thought 3(3,0) The early theories of the nation state in the 16th century and the major political thinkers, problems and movements through the 20th century. *Preq:* PO SC 103 or 105.

361 International Politics in Crisis 3(3,0) Factors contributing to the prevalence of tension and violence in the contemporary global arena are identified and analyzed, with particular emphasis on political, economic, and military roots and manifestations of conflict. *Preq:* PO SC 101 and either 103 or 105.

371 Comparative European Politics 3(3,0) Major emphasis on the United Kingdom, France, Germany, and the U.S.S.R., with brief attention given to Italy and Switzerland. Current methods of comparison will be studied and applied to the formal and informal functioning of these governments. *Preq:* PO SC 103 or 105.

373 Third World Politics 3(3,0) Survey of policies and problems of development of Third World states and their implications for the United States. *Preq:* PO SC 103 or 105.

379 Directed Study in Comparative and International Politics 3(3,0) Readings and research in comparative government and society and international affairs. *Preq:* Consent of instructor.

H390 Junior Honors Research 1(1,0) Readings and research in conjunction with an approved political science course at the 300 or 400 level. Honors status required.

403 Congressional Politics 3(3,0) Examination of the behavior and processes of decision making in the American Congress together with an analysis of the interaction among Congress and the executive and judicial branches of the national government. *Preq:* PO SC 101, Junior standing, or consent of instructor.

404, 604 Gender and Politics 3(3,0) A survey course analyzing the experience of women in the American political system. Contemporary political issues confronting women will be discussed in the light of feminist history and the nature of the American Political system. *Preq:* PO SC 101, Junior standing, or consent of instructor.

405 Presidential Leadership 3(3,0) Examination of the organizational patterns, administrative behavior, and political forces in the Presidency with considerable emphasis on relations between the Presidency and Congress, courts, and administrative regulatory agencies. *Preq:* PO SC 101, Junior standing, or consent of instructor.

407 Religion and American Politics 3(3,0) Examination of the impact of religion on American politics, including an analysis of the role of religion in politics, political behavior of major religious groups, constitutional issues and voting behavior. *Preq:* PO SC 101 or consent of instructor.

408 Topics in American Government 3(3,0) Examination of selected themes and/or issues in an area of American government, public policy, or public law. May be repeated once for credit. *Preq:* PO SC 101 or consent of instructor.

409, 609 Directed Study in American Institutions 3(3,0) Supervised reading and/or research in selected areas of American government. *Preq:* Twelve semester hours in political science and consent of instructor.

422, 622 Government Policy and Political Economy 3(3,0) Focuses on the roots and development of American political economy. Attention is given to the way in which economic factors affect American politics and the ability to govern. *Preq:* PO SC 101; Junior standing or consent of instructor.

423, 623 Urban Politics 3(3,0) Interaction of political, technical, and administrative processes in urban America. Special emphasis is given to the history and future of urban areas. *Preq:* PO SC 101, Junior standing, or consent of instructor.

425, 625 Money, Budgets and Grantsmanship 3(3,0) Examination of governmental budgeting structures and processes. A hands-on approach working with a city's past and present budget and producing next year's budget. Writing a grant proposal, optional for undergraduates, required for graduate students. *Preq:* PO SC 101, Junior standing, or consent of instructor.

426, 626 Total Quality Management in the Public Sector 3(3,0) Examination of the prin-

ciples of total quality management: a systemic, integrated approach to excellence in administration. Application to the public sector, with emphasis on empowerment, strategic planning, teamwork, quality assurance, responsiveness to customer/client needs, and education. Focuses on the works of W. Edwards Deming and other leaders. *Preq:* PO SC 101, Junior standing, or consent of instructor.

427, 627 Public Personnel Management 3(3,0) Government personnel systems; current trends and problems; essentials of recruitment, classification, compensation, motivation, evaluation, training, and discipline. *Preq:* PO SC 101, Junior standing, or consent of instructor.

428, 628 National Security Policy 3(3,0) A study of the problems in formulating policies of national defense, examination of alternatives, consequences and effectiveness of current techniques in nuclear weaponry, guerrilla and conventional warfare. *Preq:* PO SC 101, Junior standing, or consent of instructor.

432 American Constitutional Law I 3(3,0) A brief introduction to the judicial process followed by a detailed examination of leading cases pertaining to the judiciary, the Congress, the Presidency, and the federal system. *Preq:* PO SC 101, Junior standing, or consent of instructor.

433, 633 American Constitutional Law II 3(3,0) Examination of the relationship of the individual to his government, focusing on the the safeguards of liberty and property including freedoms of speech, press and religion, and criminal procedures. *Preq:* PO SC 101, Junior standing, or consent of instructor.

434 Law, Courts, and Politics 3(3,0) Introduction to the role of law, judges, and courts in the American political system, focusing on the nature of the legal system; legal methods; the role of courts in statutory construction and in the administrative process; and judicial activism and restraint. *Preq:* PO SC 101, Junior standing, or consent of instructor.

435 Criminal Law 3(3,0) Examination of the criminal justice system with special emphasis on the constitutional requirements for criminal procedure, and on the relationship between legal theory and practice in the criminal justice area. *Preq:* PO SC 101, Junior standing, or consent of instructor.

442, 642 Political Parties and Elections 3(3,0) Study of the distinctive features of the American two-party system with emphasis on presidential elections. Parties are examined as formal organizations, coalitions of voters and interest groups, coordinators of nomination and election processes, and managers of policy-making institutions. *Preq:* PO SC 101, Junior standing, or consent of instructor.

443 The Mass Media in Politics 3(3,0) Course examines the nature of public opinion, its social and political context, the social-psychological processes basic to it, the dynamics of its formation and change and its measurements. *Preq:* PO SC 101, Junior standing, or consent of instructor.

448 Campaign Strategy and Tactics 3(3,0) Practical introduction to the planning and execution of a political campaign, designed for candidate, manager and others who play key roles in a campaign. Covers the use of pertinent data, targeting, issues, organization, use of the media, direct mail, finance, etc. Includes application of those aspects to a campaign. *Preq:* PO SC 101, Junior standing, or consent of instructor.

453 American Political Thought 3(3,0) American political philosophy from the 17th century to the present with an emphasis on political and social developments since the 1770s. *Preq:* PO SC 101, Junior standing, or consent of instructor.

454 Southern Politics 3(3,0) Southern politics since 1950 with emphasis upon the characteristics of sectional politics, decline of the one-party system, impact of desegregation and civil rights activism, political resurgence of the South in the 1970s and its impact on national politics. *Preq:* PO SC 101, Junior standing, or consent of instructor.

457, 657 Political Terrorism 3(3,0) Examination and analysis of the international phenomenon of terrorism in terms of origins, operations, philosophy, and objectives. *Preq:* PO SC 103 or 105.

462, 662 Peace and Order in International Relations 3(3,0) Survey of obstacles to and advances in law and order in international relations. *Preq:* PO SC 103 or 105.

463 United States Foreign Policy 3(3,0) Focus on foreign policy in its historical perspective, examining the decision-making process in foreign policy; evaluates contemporary American capabilities, and analyzes specific issues. *Preq:* PO SC 103 or 105.

465 Foreign Policies of the Major Powers 3(3,0) Study in the foreign policies of the leading world powers with special reference to the geographic, economic, historical and political determinants of each. A general introduction to the field of foreign policy. United States foreign policy is not emphasized. *Preq:* PO SC 103 or 105.

468 Topics in International/Comparative Politics 3(3,0) Examination of selected themes and/or issues in an area of international relations or comparative politics. May be repeated once for credit. *Preq:* PO SC 101 or consent of instructor.

471 Politics of the Soviet Union 3(3,0) Examination and analysis of the Soviet Union's political process, its evolution as a communist society, and the overall direction of its international status as a superpower. Attention is also given to political and nationalist division. *Preq:* PO SC 103 or 105.

472 Japan and East Asia: Politics, Government, and Foreign Policy 3(3,0) Survey of Japanese politics, government, economy, and foreign policy, primarily in East Asia. *Preq:* PO SC 103 or 105.

475 Political Systems of Latin America 3(3,0) Examination of political processes in Latin America from both institutional and national perspectives. *Preq:* PO SC 103 or 105.

476 Politics of the Middle East 3(3,0) Comparative examination of the political processes of the Middle East, emphasizing a socio-cultural approach to the problems of political development. Overview of the course concentrates upon the Arab and non-Arab states of Jordan, Lebanon, Syria, United Arab Republic, Iran, Israel, and Turkey. *Preq:* PO SC 103 or 105.

477 Chinese Politics 3(3,0) Concepts and operation of the political system of contemporary China. Emphasis on historical and cultural understanding of Chinese politics in the 20th century. *Preq:* PO SC 103 or 105, or Junior standing, or consent of instructor.

482 The Political Novel and the Cinema 3(3,1) Consideration of how political science is treated in political novels and cinema, and how political opinions are shaped by these media. *Preq:* PO SC 103 or 105

H490 Senior Honors Thesis Research 3(3,0) Reading and research related to the senior honors thesis.

H491 Senior Honors Thesis 3(3,0) Research and writing of the senior honors thesis.

877 Public Policy Evaluation Seminar 3(3,0)

POULTRY SCIENCE (P S)

Professors: G. P. Birrenkott, Jr., B. Glick, *Head;* B. L. Hughes, D. V. Maurice, R. J. Thurston; *Associate Professors:* T. R. Scott, P. A. Skewes; *Assistant Professor:* M. A. Hall

101 Avian Pets—Biology and Owner Responsibilities 1(1,0)F Systematic coverage of the many types of birds that humans keep as social companions. The nutrition, environmental considerations, reproductive habits, health, and legal and economic aspects of these pets will be considered.

201 Poultry Husbandry 3(3,0)F A study of the principles of poultry production and marketing and of the anatomy and physiology of the economically important poultry and game bird species. *Preq:* Consent of instructor.

323 Poultry and Poultry Products Evaluation 2(0,4) Selection of layers, broilers, and turkeys. Grading of poultry products according to USDA grade standards will also be studied. Students enrolled in this course are eligible to compete in intercollegiate poultry judging contests. May be taken for a maximum of 4 credits. *Preq:* P S 201 or consent of instructor.

355, 655 Poultry Products Grading and Technology 3(2,3)S Odd-numbered years. Factors important in the quality of poultry products are considered. The effects of production, handling, packaging and storage on consumer acceptability are discussed. Quality evaluation will be considered from the standpoint of tenderness, flavor,

microbiology, and USDA grades.

400, 600 Avian Physiology 3(3,0)S Even-numbered years. Detailed study of the structure and function of organ systems of avian species with emphasis on digestion and reproduction. Students are given an opportunity to study organ system(s) of their choice using quantitative physiological techniques. *Preq:* AN PH 301, P S 201, or consent of instructor.

402, 602 Poultry Management 2(1,2)S Odd-numbered years. Continuation of P S 201 which emphasizes management, decision-making, and application of technology to the commercial production of poultry and poultry products. *Preq:* P S 201 or consent of instructor.

405, 605 Special Topics 1-4(1-3,0-3) Topics of interest to the student at the undergraduate, graduate, and professional levels. Course is designed to give experience with avian problems not covered in other courses or on thesis research. Cumulative maximum of 4 credits. *Preq:* Consent of instructor.

406, 606 Special Problems 1-3(0,3-9) Research problems of special interest to the student. Course is designed to give laboratory experience and concentrated study in an area not covered in depth in other courses. Cumulative maximum of 3 credits. *Preq:* Consent of instructor.

451, 651 Poultry Nutrition 2(2,0)F Odd-numbered years. The nutrient requirements of chickens, turkeys, and game birds and methods of determining these requirements are discussed. Deficiencies and excesses of vitamins and minerals and the effects of naturally occurring toxins are considered. Hand formulation and linear programming are introduced.

453, 653 Poultry Nutrition Laboratory 1(0,3) Course to impart training in basic laboratory skills and to familiarize students with common laboratory methods used in poultry nutrition.

458, 658 Avian Microbiology and Parasitology 4(3,3)F Even-numbered years. Agents causing poultry diseases; the diagnosis, prevention, and treatment of specific diseases and their economic and public health significance.

460, 660 Seminar 1(1,0) Current research reported in journals covering the various areas of avian science. Students practice interpretation of technical material for laymen. May be taken for a maximum of 2 credits. *Preq:* Consent of instructor.

471 Practicum 1-4(0,2-9) Practical, supervised experience in an approved commercial organization dealing with poultry production, processing, or distribution. The student will submit monthly reports during the practicum and will conduct a departmental seminar at its conclusion. *Preq:* Junior standing and consent of instructor.

804 Poultry Pathology 3(1,6)

825 Immunobiology 3(3,0)

891 Master's Research. Credit to be arranged.

PSYCHOLOGY (PSYCH)

Professors: T. R. Alley, L. Berger, W. J. Burroughs, S. N. Cole, E. H. Galluscio, *Head;* D. D. Moore, R. H. Nowaczyk; *Associate Professors:* E. G. Brainerd, Jr., P. A. Connor-Greene, L. I. Park, D. J. Senn, B. R. Stephens, J. G. Williams; *Assistant Professors:* R. L. Campbell II, D. A. King-Johnson, S. E. Kirkendol, B. A. Reilly, F. S. Switzer III, M. A. Taylor; *Visiting Assistant Professors:* P. R. Alley, L. R. Shapiro

101 Orientation to Psychology 2(2,0) General orientation to psychology as a profession, to areas of study within the discipline, and to career-planning strategies. Application of psychological theories, principles, and methods to everyday life. Open only to new Psychology majors who have not taken PSYCH 201.

201, H201 Introduction to Psychology 3(3,0) Introduction to the study of behavior. Analysis of the biological bases of behavior: learning, thinking, motivation, perception, human development, social behavior, and the application of basic principles to more complex phenomena such as education, personal adjustment, and interpersonal relations.

205 Research Methods and Measurement 3(3,0) Survey of research design used in psychology with emphasis on designs other than experimental design. Topics include attitude measurement, scaling techniques, field and observational research, and questionnaire construction. *Preq:* PSYCH 201.

210, H210 Introductory Experimental Psychology 4(3,3) Introduction to data analysis of experimental and correlational research in psychology. Emphasis is placed on the applications and logical nature of statistical reasoning. Laboratory periods stress the techniques of data analysis including analysis using microcomputers. *Preq:* PSYCH 201 or consent of instructor.

301 Applied Psychology 3(3,0) Course emphasizes the application of theories and research to the solution of problems in the community and work place. The contributions of psychology to business and industrial settings, community settings, and educational settings are considered. *Preq:* PSYCH 201.

303 Psychology of Adjustment 3(3,0) Course in personal adjustment dealing with appropriate and inappropriate reactions to stress, frustration, and conflict. Consideration is given to practical coping skills and techniques for managing emotions, changing one's own behavior, and improving interpersonal relationships. *Preq:* PSYCH 201 or consent of instructor.

306 Human Sexual Behavior 3(3,0) The subject of sexual behavior is to be approached from the psychophysiological, behavioral, and cultural points of view. Evolutionary, historical, and cross-cultural perspectives will be considered.

308 Women and Psychology 3(3,0) Explores the wide variety of psychological issues that concern women. Empirical research on topics such as motherhood, sex differentiation, motivation, and psychological disorders will be emphasized. *Preq:* PSYCH 201.

310, H310 Advanced Experimental Psychology 4(3,3) Continuation of PSYCH 210 with an emphasis on conducting original research in the scientific study of human and animal behavior. Laboratory periods stress the refinement of techniques and the execution of research in a guided setting. *Preq:* PSYCH 201, 210, or achievement of a satisfactory score on the departmental competency examination.

320 Principles of Behavior 3(3,0) Study of basic learning principles including classical conditioning, operant conditioning, and modeling. Initial emphasis is on animal studies followed by human applications and techniques: *Preq:* PSYCH 201, 210.

321 Principles of Behavior Laboratory 1(0,3) Laboratory work will include animal handling and training and applications of techniques from PSYCH 320. *Coreq:* PSYCH 320.

324 Physiological Psychology 3(3,0) Study of human neuroanatomy with emphasis on the function of the nervous and endocrine systems. Discusses the biological basis of behavior in its normal and abnormal dimensions. *Preq:* PSYCH 201 or consent of instructor.

325 Physiological Psychology Laboratory 1(0,3) Demonstrations and techniques of selected physiological procedures are presented to explain the principles discussed in PSYCH 324. *Coreq:* PSYCH 324.

330 Motivation 3(3,0) Various aspects of motivation are considered by studying physiological, emotional, and environmental influences on behavior. The orientation is empirical rather than theoretical with emphasis on pertinent research, applications, and measurement of motives. *Preq:* PSYCH 201.

333 Cognitive Psychology 3(3,0) Study of higher-order mental processing in humans. Topics include memory, learning of concepts, problem solving, and the psychology of language. *Preq:* PSYCH 201.

334 Laboratory in Cognitive Psychology 1(0,3) Selected experiments and demonstrations are conducted to reveal phenomena related to human perception, memory, reasoning, problem solving, and high-level mental processes. *Preq:* PSYCH 201 and 205 or 210 or consent of instructor. *Coreq:* PSYCH 333.

340 Life-Span Developmental Psychology 3(3,0) A survey of current theory and research concerned with the psychological aspects of human growth and development across the entire life span. Major topics include developmental methods, physical matura-

tion, cognition, socialization, personality, psycholinguistics, intelligence, learning, behavior problems, and exceptionality. *Preq:* PSYCH 201.

343 Psychological Development from Conception to Adolescence 3(3,0) Emergence, growth, and change of behavior from conception to adolescence. Special consideration is given to the study of methodologies and the beginning of sensory/perceptual abilities, intellectual capacities, language, social skills, and personality. *Preq:* PSYCH 201.

344 Psychology of Adolescence 3(3,0) Study of the psychosocial processes of adolescence. Major emphasis is on personality development, growth of thinking, social and sexual maturation, and variations in adolescence. *Preq:* PSYCH 201.

345 Adulthood and Aging 3(3,0) Special consideration of the major psychological processes of aging as they relate to individual behavior and adaptation. Included are the influences of aging on the body, learning and psychomotor skills, thinking and intelligence, employment and productivity, personality, and psychopathology. Opportunity for contact with institutionalized and noninstitutionalized elderly persons is provided. *Preq:* PSYCH 201.

352 Social Psychology 3(3,0) A survey course analyzing human social behavior from the perspective of the individual as a participant in social relationships. Major emphasis is on the study of such contemporary social processes as attitude formation and change, interpersonal relations, conformity, conflict resolution, aggression and violence, social communication, and group phenomena. *Preq:* PSYCH 201.

355 Environmental Psychology 3(3,0) Consideration of the influences of the physical environment on human behavior. Topics include perception of and adaptation to the environment, effects of physical design on behavior, and individual reactions to environmental stressors. *Preq:* PSYCH 201 or consent of instructor.

364 Industrial Psychology 3(3,0) Reviews the perception of work from the preindustrial revolution to the present. Comparative approaches to motivation, development, maintenance, and attraction of successful work behaviors are discussed. Topics include the organization's responsibilities to the community, implementing a disease- and accident-free workplace, and the effects of consumerism. *Preq:* PSYCH 201.

368 Organizational Psychology 3(3,0) Analysis of individual behavior for the purpose of investigating problems in organizations and increase organization effectiveness. Topics include psychological factors affecting communication, decision making, conflict, leadership, work stress, power, and organizational change. *Preq:* PSYCH 201.

370 Personality 3(3,0) Introduction to the area of personality theory emphasizing psychoanalytic, behavioral, and humanistic approaches. Applications of personality theories to such topics as development and adjustment are considered and research implications are evaluated. *Preq:* PSYCH 201.

397 Skills in Human Relations 3(3,0) Application of the concepts of psychology to both individual and professional behavior. A practical course which emphasizes training in human-relations skills and improving the individual's ability to relate to other persons, particularly in psychological services and professions. *Preq:* PSYCH 201 or consent of instructor.

415, 615 Systems and Theories of Psychology 3(3,0) Study of the development of psychology particularly during the past 100 years. Emphasis on giving the student a better perspective of present-day psychology. Focus is on the various approaches taken by influential psychologists and the conflicts among these approaches. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

422 Sensation and Perception 3(3,0) Study of psychophysical techniques of measurement and sensory and perceptual processes related to vision, hearing, and the other senses. *Preq:* PSYCH 201, and one 300-level psychology course or consent of instructor.

423 Sensation and Perception Laboratory 1(0,3) Selected experiments are conducted to demonstrate the phenomena involved in sensation and perception. *Preq:* PSYCH 205 or 210 or consent of instructor. *Coreq:* PSYCH 422.

426, 626 Advanced Physiological Psychology 3(3,0) Advanced studies of the biological basis of behavior with emphasis on functional neuroanatomy and endocrinology. Top-

ics may vary. May not be repeated for credit. *Preq:* PSYCH 324 or consent of instructor.

435, 635 Human Factors Psychology 3(3,0) Analyses of theoretical issues and research methods pertaining to the interaction between people and machines and human performance. Topics include information processing theory, human control systems and displays, task simulation, perceptual and motor factors limiting human performance. *Preq:* PSYCH 201, and one 300-level psychology course or consent of instructor.

459, 659 Group Dynamics 3(3,0) Review of current theory and research on small-group processes with special emphasis given to group formation and development, group structure, the dynamic forces within a group, leadership, and group problem solving and decision making. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

462, 662 Psychology and Culture 3(3,0) Seminar examining the cultural context in which (1) psychological theories and research are generated, and (2) psychological perspectives on human diversity. Topics include the philosophical positions influencing psychological theory and research; methodological issues in the study of diversity, historical and contemporary perspectives; and cross-cutural psychological research in selected content areas. *Preq:* PSYCH 310 or consent of instructor.

471 Psychological Testing 3(3,0) Introduction to the theory of psychological testing emphasizing the principles of measurement and psychometric characteristics of a good psychological test. Issues in test development, administration, and interpretation are reviewed. Educational, industrial, and clinical uses of tests are examined. *Preq:* PSYCH 201 and 210 or consent of instructor.

480, 680 Health Psychology 3(3,0) Study of the role of health-related behaviors in the prevention, development and/or exacerbation of health problems. Emphasis on the biopsychosocial model and its application in the assessment, treatment, and prevention of health problems. *Preq:* PSYCH 201, one 300-level psychology course or consent of instructor.

483, 683 Abnormal Psychology 3(3,0) Study of the physiological, psychological, and cultural factors involved in such behavioral disorders as transient situational disturbances, personality disorders, psychoneuroses, psychoses, and psychosomatic disturbances. Special emphasis is placed on the advantages and disadvantages of particular conceptual models in labeling and describing behaviors as either normal or abnormal. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

488 Theories of Psychotherapy 3(3,0) Survey of alternative theories of psychological treatment for behavioral and emotional disorders. Various theoretical assumptions, techniques, and applications of each approach are examined and compared and case examples are considered. *Preq:* PSYCH 370 or consent of instructor.

H490 Senior Division Honors Research I 2-4(2-4,0) Preparation and defense of a research proposal. The proposed project should be empirical, historical, or theoretical in nature. *Preq:* Junior standing and consent of department head.

H491 Senior Division Honors Research II 2-4(2-4,0) Completion of the proposed research project resulting in a written thesis. *Preq:* PSYCH H490.

493 Practicum in Clinical Psychology 3(1,5) Students are given an opportunity to apply classroom theory in solving individual and community problems through interaction with community agencies and other professional groups in the mental health area. The student has limited but well-controlled contact with actual clinical problems as they occur in the community environment. *Preq:* Consent of instructor.

495 Practicum in Applied Psychology 3(1,5) Students are provided practical experience in the area of applied psychology. The student usually will be involved in a project designed to help solve an industrial problem through a direct application of industrial or social psychology. *Preq:* Either PSYCH 352 or 364 or 397 and consent of instructor.

497 Directed Studies in Psychology 2-4(2-4,0) Study of a particular topic under the direction of a faculty member. Student must meet with the faculty member prior to preregistration to organize and agree upon the specific research program. Program must be submitted to department head for approval. May be repeated for a maximum of 6 credits, but only if different topics are selected. *Preq:* PSYCH 310, one additional 300-level

psychology course, and consent of instructor.

499, 699 Selected Topics 3(3,0) A seminar in current topics in psychology. Topics will change from semester to semester and will be announced prior to each semester's registration. May be repeated once for credit, but only if a different topic is covered. *Preq:* PSYCH 201 and one 300-level psychology course or consent of instructor.

810 Research Design and Quantitative Methods I 3(3,0)

811 Research Design and Quantitative Methods II 3(3,0)

822 Human Perception and Performance 3(3,0)

833 Cognitive Psychology 3(3,0)

860 Psychology of Training and Evaluation 3(3,0)

861 Personnel Psychology 3(3,0)

862 Organizational Development 3(3,0)

863 Work Motivation and Satisfaction 3(3,0)

871 Psychological Tests and Measurements 3(3,0)

891 Master's Research. Credit to be arranged.

895 Applied Psychology Internship 3-6(0,3-6)

897 Special Problems in Applied Psychology 1-3(1-3,0)

899 Selected Topics 3(3,0)

RELIGION (REL)

Professors: L. J. Greenspoon, C. H. Lippy; *Visiting Assistant Professor:* N. A. Hardesty

101 Introduction to Religion 3(3,0) Variety of religious experience and expression in human life.

102 World Religions 3(3,0) Survey of major religious traditions of the world.

301 The Old Testament 3(3,0) Survey of the books of the Old Testament with special consideration given to the development of the concepts, institutions, and theology of the ancient Hebrews.

302 A Survey of New Testament Literature 3(3,0) Study of the books of the New Testament from the standpoint of their occasion, content, literary form, and basic theology.

306 Judaism 3(3,0) Examination of the development of Judaism from Biblical to modern times.

307 The Christian Tradition 3(3,0) Examination of the development of Christianity in Western civilization from the post-New Testament period to the present, stressing institutional growth and changes, theological currents, and interaction of Christianity with culture.

308 Religions of the Ancient World 3(3,0) Selected religious movements in ancient Mesopotamia, Egypt, Canaan, and the Greco-Roman world with emphasis on movements outside the Judeo-Christian tradition.

309 Religions of Asia 3(3,0) Study of religious traditions of Asia, with an emphasis on Hinduism and Buddhism.

310 Religion in the United States 3(3,0) Development of religion in the United States from the Colonial period to the 20th century. Attention will be devoted to analyzing broad currents in religious movements and religious thought which have given shape to the American pluralistic experience.

401, 601 Studies in Biblical Literature and Religion 3(3,0) Critical examination of a selected topic in biblical studies. Topics will vary from year to year. May be repeated one time for credit. *Preq:* Consent of instructor.

402, 602 Studies in Religion 3(3,0) Thorough examination of a selected topic in one or more of the religious traditions of the world or of religious life in a particular region. Topic will vary from year to year. May be repeated one time for credit. *Preq:* Consent of instructor.

499 Independent Study 1-3(1-3,0) Study of selected problems, issues, or movements in religion under the direction of a faculty member chosen by the student. Student and faculty member develop a course of study designed for the individual student and approved by the head of the department prior to registration. *Preq:* Consent of instructor.

RURAL SOCIOLOGY (R S)

Professors: E. L. McLean, C. M. Sieverdes

301 Rural Sociology 3(3,0)S Study of human social relationships as influenced by life in the open country and in small towns and villages including considerations of the rural population, rural social institutions, processes of change in agricultural technology, and community area planning and development.

303 (SOC) Methods of Social Research I 3(3,0) See SOC 303.

359, 659 (SOC) The Community 3(3,0)F Examination of the sociological aspects of contemporary communities and of their growth and development. Structural relations of social class, status and power and the relationships among social institutions within the community are examined. Emphasis is placed on the organization and development of communities in a constantly changing environment.

371 (SOC) Population and Society 3(3,0) See SOC 371.

401, 601 (SOC) Human Ecology 3(3,0)S Analysis of the interrelationships between the physical world, modifications in natural environments, human settlement patterns, and institutions that both encourage and regulate environmental modification. Emphasis is placed on conditions whereby natural resources become public policy concerns. *Preq:* Sophomore standing.

403, 603 (SOC) Methods of Social Research II 3(3,0) See SOC 403.

471, H471 671 (SOC) Demography 3(3,0)S Demographic concepts, theory, and research methods for vital statistics, migration, and population and distribution and projections. Collection and processing of demographic data, and organization of demographic data systems. *Preq:* ANTH 201 or SOC 201, R S 301.

495 (SOC) Field Experience 3(1,8) See SOC 495.

498 (SOC) Independent Study 3(1,6) See SOC 498.

881 Rural Sociology Research 1-3(0,2-6)

RUSSIAN (RUSS)

Lecturer: J. Bridgwood

101 Elementary Russian 4(3,1) Training in pronunciation, grammatical forms, and syntax with a view to giving the student the fundamentals necessary to hold simple conversations and to read simple Russian texts.

102 Elementary Russian 4(3,1) Continuation of RUSS 101. *Preq:* RUSS 101.

201, H201 Intermediate Russian 3(3,0) Brief review of RUSS 101 and 102 with conversation, composition, and dictation, and the beginning of more serious reading of Russian prose in short stories and plays. *Preq:* RUSS 102.

202, H202 Intermediate Russian 3(3,0) Conversation, composition, and dictation based on readings of more difficult Russian prose than in the earlier courses. *Preq:* RUSS 201.

205 Russian Conversation and Composition 3(3,0) Oral and written training in Russian. The course will include situational role play, conversation groups, oral presentations, video work, written compositions, and speeches. *Preq:* RUSS 201.

398 Directed Reading 1-3(1-3,0) Directed study of selected works in Russian. May be repeated for a total of 6 semester credits. *Preq:* RUSS 202 or equivalent and consent of department head.

SCIENCE AND TECHNOLOGY IN SOCIETY (S T S)

300 Issues in Science, Technology and Society 3(3,0) Course will help students understand how technology and science operate within a total societal context by examining various issues that exist in society. Focus is placed on how we use those machines and principles and the results of that use.

SOCIOLOGY (SOC)

Professors: K. W. Crader, R. J. Knapp, R. F. Larson, *Head; Associate Professors:* J. M. Coggeshall, L. G. Peppers, J. W. Ryan, D. K. Sturkie III, B. J. Vander Mey, W. M. Wentworth, M. F. White; *Assistant Professors:* P. A. Green, J. E. Hawdon, J. P. Smith

201, H201 Introduction to Sociology 3(3,0) Sociological perspective: the study of contemporary groups, organizations, and societies in terms of human social behavior, social change, social structure, and social institutions.

202 Social Problems 3(3,0) Social problems involving the family, education, health care, political and legal systems, economy, population, environment, community; and special problems associated with age, economics, racial, status, and gender inequality.

303, H303 (R S) Methods of Social Research I 3(3,0) Introduction to methods of social research: research, design, sampling, measurement, reliability, and validity; the relationship between theory and research. Required of all Sociology majors. *Preq:* SOC 201.

310, H310 Marriage and Intimacy 3(3,0) Examination of mate selection, living together, marital relations, family planning, conflict resolution, divorce and remarriage, later life adjustments, and singlehood as a lifestyle in the United States. *Preq:* SOC 201 or consent of instructor.

311 The Family 3(3,0) Cross-cultural analysis of the family as a basic social institution; history, structure, and functions of the family in various cultures; and effects of social change on the family. *Preq:* SOC 201.

330 Industrial Sociology 3(3,0) Development of industrial society; effects of culture, social institutions, and individuals; industry and community; cross-national comparison of management styles; and a comparative analysis of work in industrial and developing nations. *Preq:* SOC 201.

331 Urban Sociology 3(3,0) Urbanization as a social process and related conditions of work, family structure, social mobility, crime, lifestyle, technology, and development of urban areas in the Third World. *Preq:* SOC 201.

350 Self and Society 3(3,0) Social psychology from the sociological viewpoint. Examination of the interactional and group influences on such individual conditions as childhood and life-course development, language, emotions, motives, sexuality, deviance, and self-concept. *Preq:* SOC 201.

351 Collective Behavior 3(3,0) Spontaneous, transitory, and sporadic group behavior: crowds, panics, riots, fads, and social movements. *Preq:* SOC 201.

359, 659 (R S) The Community 3(3,0) See R S 359.

371 (R S) Population and Society 3(3,0) Social, economic, and political consequences of population structure and change, including problems of food and resources, as well as population goals and policies in developing countries and the United States. *Preq:* SOC 201.

380 Introduction to Social Services 3(3,0) Fundamentals of casework practice, including philosophy and values, models of group work and ethics in social services work. *Preq:* SOC 201.

390 The Criminal Justice System 3(3,0) Social systems analysis of criminal justice agencies; primary focus on law enforcement and corrections and their interagency relationship with courts and prosecution. *Preq:* SOC 201.

391 Sociology of Deviance 3(3,0) Patterns of deviant behavior: subcultures, careers, and lifestyles of deviants; deviance theory and research. *Preq:* SOC 201.

392 Juvenile Delinquency 3(3,0) The nature, extent, and causes of juvenile delinquency;

societal attempts to control delinquent conduct and gang violence; emergence of the juvenile justice system. *Preq:* SOC 201.

393 Criminology 3(3,0) The nature and causes of criminal behavior; societal attempts to control crime; social responses to crime, criminals, and the criminal justice system. *Preq:* SOC 201.

394, H394 Sociology of Mental Illness 3(3,0) Mental illness as a social phenomenon, including cultural and social influence, organizational settings of mental health-care delivery, legal issues, patient-therapist relationships, and mental illness intervention as social control. *Preq:* SOC 201.

395 Sociology of Alcohol and Drug Abuse 3(3,0) Social issues involved in alcohol and drug abuse, including the assessment of sociological theories of drug abuse, addiction, and prevention; societal problems associated with the misuse of alcohol, narcotics, and other drugs. *Preq:* SOC 201.

401, 601 (R S) Human Ecology 3(3,0) See R S 401.

403, 603 (R S) Methods of Social Research II 3(3,0) Advanced methods in social research; consideration of various techniques, methodological approaches, and research designs; laboratory experience in various phases of research. *Preq:* SOC 201, SOC (R S) 303, and Junior standing or consent of instructor.

404, 604 Sociological Theory 3(3,0) A survey of the development of sociological theory. Required of all Sociology majors. *Preq:* SOC 201 and Junior standing or consent of instructor.

H408 Honors Thesis Research I 3 Reading and research related to the senior honors thesis. Completion of junior honors requirements and approval of department head and thesis adviser required. *Preq:* SOC H303, H310, and honors status.

H409 Honors Thesis Research II 3 Research and writing related to the senior honors thesis. *Preq:* SOC H408 and honors status.

430, 630 Sociology of Organizations 3(3,0) The analysis of administrative organizations and voluntary associations; applied analysis of their formal and informal group relations, communications, and effectiveness. *Preq:* SOC 201 and Junior standing or consent of instructor.

432 Sociology of Religion 3(3,0) A sociological analysis of religious systems and movements and their influence on other social institutions. *Preq:* SOC 201 and Junior standing or consent of instructor.

433, 633 Developing Societies 3(3,0) Examination of the social and historical causes of development and underdevelopment. Various sociological theories of development are reviewed. Selected countries are examined in an international context. *Preq:* SOC 201 and Junior standing or consent of instructor.

440, 640 Leisure, the Mass Media, and Culture 3(3,0) Production and consumption of leisure activities in contemporary society; popular culture, and the mass media as dominant leisure forms; social effects of leisure activities; relationship between work and leisure. *Preq:* SOC 201 and Junior standing or consent of instructor.

441, 641 Sociology of Sport 3(3,0) Sport as a social phenomenon; emphasis on leadership, discrimination, socialization, communication, conflict, and cooperation in sports; emerging social issues in contemporary sports. *Preq:* SOC 201 and Junior standing or consent of instructor.

460, 660 Race, Ethnicity, and Class 3(3,0) Investigation of sociological perspectives on race, ethnic relations, and social stratification. Analysis of the impact of social class on minority movements. (Not open to students who have taken SOC 431.) *Preq:* SOC 201 and Junior standing or consent of instructor.

461 Sex Roles 3(3,0) Female and male socialization; changes in statuses, roles, inequality, and opportunities in contemporary society, with cross-cultural and social class comparisons. *Preq:* SOC 201 and Junior standing or consent of instructor.

462, 662 Men, Masculinity and Society 3(3,0) Masculinity and social order: norms, roles, relationships and activities; identity and socialization: work, family, sexuality, war, sports, including subcultural comparisons. *Preq:* SOC 201 and Junior standing

or consent of instructor.

471, H471, 671 (R S) Demography 3(3,0) See R S 471.

480, 680 Medical Sociology 3(3,0) Sociocultural factors in the etiology and treatment of physical illness; medical occupations and professions; the organization of health-care delivery systems. *Preq:* SOC 201 and Junior standing or consent of instructor.

481, 681 Aging and Death 3(3,0) Sociological orientation to aging populations focusing on the impact of health care, welfare, and retirement systems. Includes dying as a social phenomenon, suicide, euthanasia, and funerals. (Not open to students who have taken SOC 383.) *Preq:* SOC 201 and Junior standing or consent of instructor.

484, 684 Child Abuse and Treatment 3(3,0) Examination of the causes and consequences of child maltreatment and exploitation; forms of child maltreatment (physical, emotional, and sexual abuse; child neglect; child labor); strategies and techniques of victim and offender treatment; and child maltreatment and social policy. *Preq:* SOC 201 and Junior standing or consent of instructor.

495 (R S) Field Experience 3(1,8) Students participate in selected field placements under supervision for eight hours weekly and in a one-hour seminar per week. May be repeated once for credit. To be taken Pass/Fail only. *Preq:* SOC 380 or 390 and consent of department head.

498 (R S) Independent Study 3(1,6) Individual readings or projects in sociological areas not covered in other courses. A written proposal approved by the instructor directing the work and by the department head prior to registration. *Preq:* Consent of department head.

499 Seminar in Selected Topics in Contemporary Sociology 3(3,0) Sociological areas of current interest will be explored. May be repeated by special arrangement for a maximum of 6 credits. *Preq:* Consent of department head.

803 Survey Designs for Applied Social Research 3(3,0)

805 Evaluation Research 3(3,0)

810 Theoretical Models in Applied Social Research 3(3,0)

812 Seminar on Marriage and the Family 3(3,0)

814 Policy and Social Action 3(3,0)

830 Human Systems Development: Organizations and Society 3(3,0)

833 Work and Society 3(3,0)

835 Work, Leisure and the Family 3(3,0)

891 Masters Research. Credit to be arranged.

892 Selected Topics 3(3,0)

895 Field Experience 3-6

896 Independent Study 1-3(1-3,0)

899 Special Projects 1-3(1-3,0)

SPANISH (SPAN)

Associate Professors: P. R. Heusinkveld, S. C. King, L. T. Perry, J. I. Suarez, S. E. Torres; *Assistant Professors;* C. R. Adams, G. Bautista, J. K. Hurley, M. A. Maggiari, R. F. Mixon, L. E. Seamon, J. M. Whitmire; *Instructors:* S. K. Harris, J. A. Worley; *Visiting Instructors:* L. Manye-Cox, J. G. Peacock

101 Elementary Spanish 4(3,1) A course for beginners in which the essentials of grammar are taught and a foundation is provided for a conversational and reading knowledge of the language. Three hours a week of classroom instruction and one hour a week in the language laboratory.

102 Elementary Spanish 4(3,1) Continuation of SPAN 101.

190 Study and Travel Abroad Preparation 1(1,0) Designed to prepare students for study/travel in Spanish-speaking countries. Students will be sensitized to cross-cultural differences and will be provided with practical skills and sources of information. Taught

mainly in English. To be taken Pass/Fail only.

199 Situational Spanish 4(3,2) Continuation of SPAN 198. Subsequent placement into SPAN 201 by departmental examination. Only for elective credit in the College of Liberal Arts. Cannot be counted toward any Bachelor of Arts language requirements. *Preq:* SPAN 198 or consent of instructor.

201, H201 Intermediate Spanish 3(3,0) A brief review of SPAN 101 and 102, with grammar, composition, and conversation and the beginning of more intensive reading of Spanish prose. *Preq:* SPAN 102.

202, H202 Intermediate Spanish 3(3,0) Continuation of SPAN 201. *Preq:* SPAN 201.

299 Foreign Language Drama Laboratory 1(0,3) Participation in foreign language drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a total of 3 credits. *Preq:* Consent of instructor directing the play.

301 Introduction to Hispanic Literary Forms 3(3,0) Introduction to the basic structures and elements of fiction, poetry, drama, and essay, including literary and critical theory, with readings in 19th and 20th century Spanish and Spanish-American literatures. *Preq:* SPAN 202.

302 Intermediate Spanish Grammar and Composition 3(3,0) Intensive review of Spanish structure, verbs, idioms, and vocabulary with an introduction to syntax and stylistics through controlled and free composition. *Preq:* SPAN 202 or consent of department head.

303 Survey of Spanish Literature I 3(3,0) Literary movements, influences, and authors from the beginnings to the end of the 17th century. Representative works, discussions. *Preq:* SPAN 201, 202.

304 Survey of Spanish Literature II 3(3,0) Literary movements, influences, and authors from the 18th century to the present. *Preq:* SPAN 201, 202.

305 Intermediate Spanish Conversation and Composition I 3(3,0) Practice in spoken Spanish with emphasis on vocabulary, pronunciation, intonation, and comprehension. Written work to increase accuracy. Assignments in the language laboratory. *Preq:* SPAN 202 or consent of department head.

307 Spanish Civilization 3(3,0) Study of the the significant aspects of the culture of Spain from its origins to the present. *Preq:* SPAN 202 or consent of department head.

308 Spanish-American Civilization 3(3,0) Study of the significant aspects of the culture of Spanish-American countries from the pre-Colonial period to the present. *Preq:* SPAN 202 or consent of department head.

309 Introduction to Spanish Phonetics 3(3,0) Study of the basic concepts of phonetics and phonology, fundamental principles of Spanish pronunciation and International Phonetic Alphabet. *Preq:* SPAN 202 or consent of department head.

311 Survey of Spanish-American Literature 3(3,0) Literary movements, influences, authors, and works from the Colonial period to the present. *Preq:* SPAN 202 or consent of department head.

316 Spanish for International Trade I 3(3,0) Spoken and written Spanish common to the Hispanic world of business and industry, with emphasis on business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analysis of American and Spanish cultural patterns in a business setting. *Preq or Coreq:* SPAN 202 and 305, or consent of department head.

398 Directed Reading 1-3(1-3,0) Directed study of selected topics in Spanish literature, language, and culture. May be repeated for a maximum of 6 credits. *Preq:* Consent of department head.

401 Modern Spanish Literature 3(3,0) The generation of 1898 to the Civil War. Readings from Unamuno, Azorin, Valle-Inclan, Antonio Machado, Ortega Y Gasset, Garcia Lorca, and Alejandro Casona. *Preq:* SPAN 303, 304, or 311.

402 Contemporary Spanish Literature 3(3,0) Spanish literature from Civil War reconstruction period to the present with emphasis on the contemporary novel and theatre.

Preq: SPAN 303, 304, or 311.

403 Spanish American Women Writers 3(3,0) An indepth study of selected literary works written by Spanish American women. Representative authors are studies within their philosophical and socio-political contexts. *Preq:* Spanish 300-level literature course or consent of department head.

409 Advanced Grammar and Composition 3(3,0) Continuation of SPAN 302 with intensive study of syntax and stylistics through composition and translations. Practice in spoken Spanish. *Preq:* SPAN 302, Senior standing, or consent of department head.

411 Advanced Spanish Conversation and Composition 3(3,0) Continuation of SPAN 305 with emphasis on greater fluency and sophistication in oral and written expression. *Preq:* SPAN 305 or consent of department head.

412 Translation Theories and Techniques 3(3,0) Introduction to the theories and techniques of translations, using a variety of texts as a starting point for discussion of stylistic and grammatical difficulties. The course will be eminently practical, with student translations being systematically compared with professional translations. *Preq:* Spanish 300-level literature course or consent of department head.

416 Spanish for International Trade II 3(3,0) Study of the language and cultural environment of the Spanish-speaking markets of the world, including the linguistic and cultural idioms which support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. *Preq:* SPAN 316.

422 The Contemporary Spanish-American Novel 3(3,0) New trends in the development of the Spanish-American novel from the 1940s to the present. *Preq:* SPAN 303, 304, or 311.

435 Contemporary Hispanic Culture 3(3,0) Study of social, political, economic, and artistic manifestations of contemporary Hispanic culture. *Preq:* SPAN 307, 308, or consent of department head.

498 Independent Study 1-3(1-3,0-3) Directed study of selected topics in Spanish language, literature, and culture. *Preq:* Consent of department head.

499, 699 Spanish Literature, Language, and Culture 3(3,0) Selected topics and themes that have characterized Spanish literature, language, and culture throughout the centuries. May be repeated for a maximum of 6 credits. *Preq:* SPAN 303, 304, 311, or consent of department head.

SPEECH (SPCH)

Professor: H. L. Goodall; *Assistant Professors:* D. S. Geddes, P. M. Kellet, F. E. Marrus; *Instructors:* L. F. Armstrong, L. L. Sager, E. R. Smith; *Visiting Instructors:* D. R. Clarke, Jr., P. L. Geldard

150 Introduction to Speech Communication 3(3,0) Provides students with an overview of theoretical approaches to the study of communication, including the theory and practice of interpersonal/small group/public communication.

162 Forensic Laboratory 1(0,3) Research, preparation, and practice leading to participation in on-campus and intercollegiate debate and individual events competition. May be repeated for a maximum of 4 credits.

248 Interpersonal Communication 3(3,0) Examination of the principles and skills involved in effective interpersonal communication. Includes study of verbal and nonverbal communication behaviors essential to initiating and maintaining relationships and communication behavior in friendships, families, romantic relationships, and among co-workers.

250 Public Speaking 3(3,0) Practical instruction in public speaking; practice in the preparation, delivery, and criticism of short speeches. The course will develop an understanding and knowledge of the process of communication.

260 Broadcasting Internship 1-3(0,2-6) Part- or full-time supervised work experience with a television or radio network, station, or related industry such as an advertising agency handling broadcasting clients. To be taken Pass/Fail only. *Preq:* Consent of instructor.

268 (THEA) Voice and Diction 3(2,3) Practical work to improve vocal clarity and tonal quality of the student's speech. Corrects such voice and diction problems as improper enunciation and extreme dialects.

300 Communication in a World Context 3(3,0) An in-depth examination of differences in communication practices and meanings as seen through a global perspective. *Preq:* SPCH 150, 250, or consent of instructor.

330 Nonverbal Communication 3(3,0) Develops a knowledge of the functions of nonverbal behaviors in human interaction. This includes the study of gesture and movement, physical appearance, vocal behavior, immediacy, time and space, and intercultural differences. Promotes understanding of nonverbal rules.

340 Negotiations Communication 3(3,0) Develops a knowledge of the basic strategies and elements of communication used in effective negotiation. This includes techniques of dealing with people, interests, options, and the criteria necessary in order to reach agreements and objectives.

350 Small Group Communication 3(3,0) Examines the principles and skills involved in effective small-group communication.

360 Persuasion 3(3,0) Theories of persuasion and propaganda; practical instruction in the composition of persuasive speeches. *Preq:* SPCH 250.

361 Argumentation and Debate 3(3,0) Basic principles of argumentation with emphasis on developing skills in argumentative speech. The role of the advocate in contemporary society with an emphasis on and an appreciation of formal debate. *Preq:* Consent of instructor.

362 Organizational Communication Simulation 3(3,0) Designed to help students develop and apply communication skills which will be useful in a variety of organizational settings: Taking and conducting interviews, group decision-making, and oral reporting. Discusses communication processes and provides personal and professional development. *Preq:* SPCH 250 or consent of instructor.

363 (THEA) Oral Interpretation of Literature 3(3,0) Analysis and oral interpretation of selected poetry and prose; training in development of effective tone production.

364 Organizational Communication 3(3,0) Examination of the process, theories, and techniques of communications within small groups and other organized bodies.

365 Broadcasting: History and Criticism 3(3,0) A critical examination of the history and issues of broadcasting in America.

366 Special Topics in Speech 3(3,0) Consideration of select major areas of study in speech. May be repeated with consent of department head.

368 Survey of Communication Disorders 3(3,0) Disorders in articulation, language, hearing, voice, and fluency will be surveyed by description of normal development, etiology, identification, and intervention strategies.

369 Modern American Political Rhetoric 3(3,0) Examination of American political rhetoric after 1900, focusing on such notable speakers as Franklin D. Roosevelt, John F. Kennedy, and Martin Luther King, Jr.

401 Speech Communication Theories 3(3,0) The various theories and models of communication that characterize the field of speech communication. Course focuses on how communication is conceptualized from different theoretical perspectives.

455 Gender Communication 3(3,0) Course explores the ways communication behaviors and perceptions of communication behavior are affected by gender. The effects of gender on a variety of communication contexts are examined, including interpersonal, small group, organizational, and mass communication.

460 Communication and Conflict Management 3(3,0) Introduces the study of communication practices in conflict situations within various personal and professional settings. Emphasis is on the central role of communication in the understanding and management of conflict. *Preq:* SPCH 150 or 250 or consent of instructor.

464, 664 Advanced Organizational Communication 3(3,0) Application of speech communication methodology to the analysis of organizational communication processes. Students study methods of organizational communication analysis and interven-

tion. *Preq:* SPCH 364 or consent of instructor.

480 Intercultural Communication 3(3,0) Introduces the process of communication between and among individuals from different cultures or subcultures. Emphasis is on the effect of cultural practices within various communication relational contexts such as interpersonal, small group, and organizational communication. *Preq:* SPCH 150 or 250 or consent of instructor.

491, 691 (ENGL) Classical Rhetoric 3(3,0) See ENGL 491.

492, 692 (ENGL) Modern Rhetoric 3(3,0) See ENGL 492.

499 Independent Study 1-3(1-3,0) Tutorial work for students with special interests or projects in speech communication outside the scope of existing courses. *Preq:* Consent of the department head.

TEXTILE CHEMISTRY (T C)

Professors: J. R. Aspland, H. M. Behery, M. J. Drews, B. C. Goswami, C. W. Jarvis, J. J. Porter, D. V. Rippy, *Director;* C. D. Rogers, B. L. Rutledge II, E. A. Vaughn; *Associate Professors:* M. S. Ellison, O. F. Hunter, Sr., G. C. Lickfield; *Assistant Professors:* R. V. Gregory, S. R. Matic-Leigh; *Lecturer:* J. C. Hubbard

303 Textile Chemistry 3(3,0) Study of the properties and reactions of aliphatic and aromatic organic compounds. Emphasis will be placed on mechanistic interpretations and the development of synthetic schemes leading to polyfunctional compounds of the types encountered in the textile industry. *Preq:* CH 102. *Coreq:* MTHSC 206 or 207.

304 Textile Chemistry 3(3,0) Fundamental principles of physical chemistry with emphasis on areas frequently encountered in the textile industry including thermodynamics, kinetics and solution properties. These concepts will be applied to the study of organic compounds and organic reaction mechanisms. *Preq:* T C 303.

305 Textile Chemistry Laboratory 1(0,3) Introduction to the techniques used in the synthesis and characterization of organic compounds. *Coreq:* T C 303.

306 Textile Chemistry Laboratory 1(0,3) Techniques used in the measurement of the physiochemical properties of polymers and textile chemicals. *Coreq:* T C 304.

315, H315, 615 Introduction to Polymer Science and Engineering 3(3,0) Chemistry of monomers and polymers and the chemical and physical properties of polymers are discussed emphasizing fiber forming, synthetic polymers. Includes molecular characterization, structure, morphology, and mechanical properties as they relate to the design of polymer systems for end uses in textiles, geotextiles, plastics and fiber-reinforced composite materials. *Preq:* CH 201 and 330 or 224, T C 304, or consent of instructor.

316, 616 Chemical Preparation of Textiles 3(2,3) The chemicals used in the preparation of fabric for dyeing and finishing. Oxidizing and reducing agents and their control and effect on various fibers. Collodial and surface active properties of various compounds and the fundamental factors influencing these properties.

317 Polymer and Fiber Laboratory 1(0,3) High molecular weight polymers are prepared from monomers and their chemical and physical properties are measured as functions of critical end use parameters using instrumental and physical methods. *Coreq:* T C 315.

405 Principles of Textile Printing 3(2,3) The development of modern textile printing systems will be studied. In addition, the colloidal requirements of colorants, thickener compositions, rheology of printing pastes, and the various physical requirements necessary for a successful printing system in a modern plant will be examined. *Preq:* T C 316 or consent of instructor.

406 Textile Finishing—Theory and Practice 3(2,3) Study of the application of chemicals to textile substrates and how they affect the substrate's physical and chemical properties. The course emphasizes the theories of chemical modification of textiles as well as the technology of finishing.

457, H457, 657 Dyeing and Finishing I 3(3,0) To understand the physical, chemical and mechanical principles behind the application of colors and finishes to textiles. This

will require an appreciation of fiber chemistry and morphology, dye and finish structures and reactivity and the mechanical principles behind the equipment used to effect transfer of these chemicals onto the textile substrate.

458, H458, 658 Dyeing and Finishing II 3(3,0) The kinetics and equilibria of dyeing processes. The use of conductivity, diffusion and other methods useful for measuring absorption of isotherms and dyeing rates and the general thermodynamic relationships applicable to dyeing operations. Fiber properties such as zeta potential, dye sites, relative amorphous area available will be included.

459, 659 Dyeing and Finishing Laboratory I 1(0,3) Course will introduce the student to common dyeing and printing methods and to some of the machinery necessary to carry out dyeing operations. *Coreq:* T C 457.

460 Dyeing and Finishing Laboratory II 1(0,3) Course will cover finishing in addition to dyeing operations and their instrumental control. *Coreq:* T C 458.

475, 675 Cellulose Chemistry 2(2,0) The organic chemistry of cellulose and its derivatives is developed from the basic principles of carbohydrate chemistry. Emphasis is placed on the substitution and degradation reactions which are of particular importance in textile applications. Fiber morphology is treated in relation to its effect on textile chemical processing. *Preq:* T C 315 or consent of instructor.

811 Polymer Science I 3(3,0)

812 Polymer Science II 3(3,0)

820 (CH E) Composite Polymeric Materials 3(3,0)

821 Chemistry of Natural Polymers 3(3,0)

831 The Physical Chemistry of Dyeing 3(3,0)

840 Analytical Methods in Textile and Polymer Science 3(3,0)

891 Master's Research. Credit to be arranged.

TEXTILE MANAGEMENT AND TEXTILE SCIENCE (TEXT)

Professors: J. R. Aspland, H. M. Behery, M. J. Drews, B. C. Goswami, C. W. Jarvis, J. J. Porter, D. V. Rippy, *Director;* C. D. Rogers, B. L. Rutledge II, E. A. Vaughn; *Associate Professors:* M. S. Ellison, O. F. Hunter, Sr., G. C. Lickfield; *Assistant Professors:* R. V. Gregory, S. R. Matic-Leigh; *Lecturer:* J. C. Hubbard

175 Introduction to Textile Manufacturing 3(3,0) Introduction to the broad fields of textile, fiber, and polymer science and engineering with emphasis on the scientific, technological, and business principles utilized in producing fibers, yarns, and fabrics; enhancing fabric functionality by dyeing, finishing and printing; and establishing end-use products.

176 Natural and Man-made Fibers 4(3,3) Concept of natural and synthetic polymers as the raw materials of the textile industry is introduced. A survey of the origin, characteristics, and processing properties of various natural fibers and fiber-forming synthetic polymers. Formation of textile fibers from polymeric materials will be presented with specific emphasis on the polymer science and engineering principles.

201 Yarn Structures and Formation 4(3,3) Study of the fiber processing systems required to transform various fibrous materials into yarn. The course involves the machine principles and theories, relationship of the fibers to the process and the resultant yarn structures, and subsequent analysis of the yarn structure to define quality and to determine suitable manufacturing practices. *Preq:* TEXT 175 and 176 or consent of instructor.

202 Fabric Structures, Design, and Analysis 4(3,3) Study of fabric formation techniques designed to explore the principles and theories of modern technology. Evaluation and analysis of weaving, knitting, and nonwoven fabrication of textile structures. *Preq:* TEXT 201 or consent of instructor.

203 Introduction to Computer Applications in Textiles 3(3,0) Introduction to the use of micro and minicomputers and mainframe terminal sharing in the textile industry. Topics will include computer applications in both processing and management using

BASIC and FORTRAN.

301 Fiber Processing I 3(2,2) Study of fibrous materials and their relationships to the fiber processing systems. The objectives, theories, principles, and mechanisms of the machines used in the earlier stages of fiber processing. The course is directed primarily to the staple fiber processing systems. Mechanical and mathematical fundamentals are applied to the machines concerned.

302 Fiber Processing II 3(2,2) Continuation of TEXT 301 emphasizing the later stages of fiber processing for the ultimate yarn strand. *Preq:* TEXT 301.

308 Apparel 4(3,3) Introduction to apparel construction techniques and analysis of problems commonly encountered in the apparel industry. Evaluation of fabric design and properties. *Preq:* TEXT 202 or consent of instructor.

311 Fabric Development I 3(2,2) Study of the basic theory of the cam loom weaving machine. The principles of designs of the basic plain, twill, and sateen fabric, and other weaves such as the honeycomb, the mock leno, and the huckaback weave. Weave analysis and preparation of necessary drafts are included.

312 Fabric Development II 3(2,2) Study of the theory and operation of the dobby head, Knowles head, Staubli dobby, Jacquard head, and multicolor selection for the above looms. Weave design for compound fabrics using two or more systems of warp and filling threads for three-dimensional weaves, weave analysis, and preparation of drafts are covered. *Preq:* TEXT 311.

313 Fabric Formation 3(3,0) Examination of the theories involved in the assembly of fibers and yarns into fabrics. The application of design, analysis and production of woven, knitted and nonwoven fabrics. A brief survey of the fabric-producing machines. Limited to Textile Chemistry and non-Textile majors.

314 Chemical Processing of Textiles 4(3,2) Concepts of current procedures in the chemical, mechanical and physical preparation, and in bleaching, dyeing, printing and finishing of fabrics are presented; colorimetric and spectrophotometric methods of color control and test methods for the evaluation of the effectiveness of the treatments are emphasized. Not open to Textile Chemistry or Textile Management Chemical option majors.

321, H321, 621 Fiber Science 3(2,2) The student will become familiar with the physical properties of textile and high performance fibers, and how these properties influence process and end-use performance; method of measuring those properties; and how those properties are related to structural features of the fiber.

322, 622 Properties of Textile Structures 3(2,2) Yarn and fabric properties, their scientific significance and analysis. Dimensional, structural, and mechanical interrelationships are established and evaluated.

324 Textile Statistics 3(3,0) Introduction to statistics with particular application to the textile industry. Measures of central value and variation, probability, the normal curve, tests of hypotheses, elementary correlation and regression. *Preq:* Sophomore standing or consent of instructor.

333 The Textile Arts 3(2,3) Survey of the development of the hand loom from prehistoric times to the present. Studio work in the elements of handwoven fabrics, their design, analysis and production of four-harness counterbalance and jack looms. *Preq:* Junior standing or consent of instructor.

403, 603 Fiber Processing III 3(2,2) Concepts of current fiber processing machines, techniques, practices, and their validity are investigated. Problems are assigned that require use of acquired knowledge, textile testing equipment, and processing machines. The relation of fibrous material properties and processing dynamics to the fiber assemblies produced is studied. *Preq:* TEXT 201 or 302.

411, 611 Fabric Development III 3(2,2) Study of specifications and loom details for the production of fabrics woven to the customer's order, including multicolor layouts. Warp and filling preparation are covered as well as size formulations and their methods of application. Warping and dressing plans are developed for the warper and the slasher. *Preq:* TEXT 202 or 312.

414 Knitted Structures 3(3,0) Survey of knitted structures dealing with the principles

and mechanisms involved. Various systems are covered with emphasis on fiber and yarn requirements and fabric properties.

416 Nonwoven Structures 3(2,2) Nonwoven fabric structures, their manufacture, properties, and applications. Methods of nonwoven fabric formation, resultant material characteristics and end-use applications are examined. *Preq:* TEXT 201 or 301.

420, 620 Advanced Computer Applications in Textiles 3(3,0) Advanced study of the use of computer as professional support devices for textile management, research, and manufacturing, decision making. *Preq:* CP SC 120 or consent of instructor.

426, 626 Instrumentation 3(3,0) The principles of industrial and process instrumentation and control as applied in the textile industry. Static and dynamic characteristics of measurement devices. Transducer principles and techniques of their application for measurement of physical properties such as pressure, temperature, flow, weight, etc. Principles of process controllers. Applications of computers in textile process control.

428 Textile Research 1-3 Investigation of a problem in textile, fiber, or polymer science under the direct supervision of a faculty member. After completing the research, the student prepares a formal written report which is presented orally. *Preq:* Senior standing or consent of instructor.

429 Textile Research 1-3 Continuation of TEXT 428.

440, 640 Color Science 3(2,3) Application of the science of color to industrial practice in textiles, plastics, paints, lighting, and ceramics. Laboratory work will be performed on modern instruments and computers.

450 Textiles in Sports and Recreation 3(3,0) This course provides a basic understanding of the various types of fabrics used in athletic and recreational activities. Methods and procedures for the evaluation of fabric performance and properties as well as criteria for the selection and care of textile materials used in sports and recreational activities are provided.

460, 660 Textile Processes 3(3,0) Survey of machinery and processes of textile manufacturing from fiber formation through fabric finishing. For students with a nontextile background.

470 Textile Costing and Inventory Control 3(3,0) Study of the principles of costing as they specifically apply to the manufacture of textiles. Allocation of cost of material, labor, and overhead: determining the unit cost of yarns, fabrics, and finishes. Inventory systems, storage, materials handling and profiles. *Preq:* TEXT 202 or consent of instructor.

471 Plant Layout and Processing Design 3(3,0) Survey of the essentials necessary for textile process implementation from the pilot plant concept to a functioning textile process facility. Consideration will be given to material flow requirements, power requirements, machinery layout, environmental controls, and facility design. *Preq:* TEXT 202.

472, 672 Textile International Trade 3(3,0) The course will analyze the current structure of the international textile trade including imports, exports, tariffs and trade requirements. Field experience with local firms will be used to enhance the student's understanding. *Preq:* Senior standing or consent of instructor.

475, 675 Textile Marketing 3(3,0) Examination of the activities involved in the distribution of textile products in today's market. Emphasis will be placed on the role of consumer research and the analysis of fashion in the design and promotion of textile products.

476, 676 Carpet Manufacturing 3(3,0) Study of the materials, manufacturing technologies, products, and practices associated with the carpet manufacturing sector of the textile industry. Raw materials, product design, formation and finishing systems, evaluation methods, distribution and end-use applications are examined. *Preq:* TEXT 201, 202, or consent of instructor.

701 Applied Science Technologies 3(2,4)

821 Fiber Physics I 3(3,0)

822 Fiber Physics II 3(3,0)

830 Textile Physics 3(3,0)

835 Textile Structures 3(3,0)

840 Advanced Color Science 3(2,3)

845 Geotextiles and Geomembranes in Engineering Structures 3(3,0)

846 Textile Structures II 3(3,0)

866 Fiber Formation 3(3,0)

870 Advances in Textile Manufacturing 3(3,0)

880 Selected Topics 3(3,0)

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

THEATRE (THEA)

Professors: C. S. M. Egan, *Head;* R. C. Sawyer; *Assistant Professors:* D. J. Hartmann, W. L. Overly, R. P. Thomason; *Visiting Assistant Professor:* C. A. Collins

210 Theatre Appreciation 3(3,0) Examination of the theatre event approached through historical context, play reading, analysis of production practices, and field trips to live dramatic performances.

267 Stage Makeup Techniques 3(2,1) Designed as a practical study of basic stage makeup techniques for the acting student including corrective makeup, modeling with paint, three-dimensional makeup, prosthesis with latex, and makeup for other media.

268 (SPCH) Voice and Diction 3(2,3) See SPCH 268.

274 Stage Movement for Actors 3(1,2) Study of the psychological and physical sources of movement in the human body, with emphasis on the attainment of intellectual and physical control and the application of the skills to the development of a role.

279 Theatre Laboratory 1(0,3) Practical work in theatre on a production designed for public presentation. May be repeated for a maximum of 4 credits.

347 (ENGL) The Structure of Drama 3(3,0) Introduction to the creative writing and critical study of drama. *Preq:* Sophomore literature or consent of instructor.

363 (SPCH) Oral Interpretation of Literature 3(3,0) See SPCH 363.

372 Creative Drama in the Classroom 3(3,0) Provides practical applications using creative drama as a learning tool to strengthen curriculum goals and heighten student participation in the classroom. Students will develop classroom teaching strategies based on drama education. Appropriate for elementary and secondary teachers, artists, and workshop leaders.

375 Acting I 3(2,3) Fundamentals of acting; basic stage techniques; exercises in interpretation, improvisation, characterization; experience in supervised performance. *Preq:* Sophomore standing.

376 Principles of Stage Direction 3(2,3) Directing and staging techniques for the proscenium stage; exercises in composition, movement, picturization; experience in direction of scenes. *Preq:* Sophomore standing.

377 Stagecraft 3(2,3) Theory and practice of stage design and technology. *Preq:* Sophomore standing.

378 Historical Survey of the Theatre 3(3,0) Study of the changing roles of the playwright, director, actor, technician, and spectator in the Western theatre. *Preq:* Sophomore standing.

379 Acting Ensemble 1(0,3) Continued study and practice of the craft of acting. Particular scene study to be determined by instructor. *Preq:* THEA 375 and consent of instructor.

387 Stage Lighting 3(2,1) Theory and practice of stage lighting through an understanding of various lighting instruments, lighting control systems, and execution of light-

ing designs. *Preq:* THEA 377.

397 Scene Painting 3(2,1) Practical study of basic painting techniques for the theatre including layout, proper use of materials, painting styles, and texturing techniques. *Preq:* THEA 377.

398 Special Topics in Theatre 3(3,0) Select areas of study in theatre not addressed by other theatre course offerings. May be repeated once. *Preq:* Consent of instructor.

447 (ENGL) Playwriting Workshop 3(0,3) Workshop in the creative writing of plays. *Preq:* THEA (ENGL) 347.

475 Acting II 3(2,3) Study and practice of acting styles and techniques, including those for period plays, musicals, and nonprocenium contemporary forms. *Preq:* Consent of instructor.

476 Advanced Stage Direction 3(2,3) Study of production practices, problems, and techniques of style and composition, including those for period plays, musicals, and plays presented in nonprocenium staging areas. *Preq:* THEA 376 or consent of instructor.

477 Stage Design 3(2,3) Study and practice in stage design, including drafting, graphics, drawing, rendering, scene painting, and light plotting. *Preq:* THEA 377 or consent of instructor.

499 Independent Studies 1-3(1-3,0) Tutorial work for students with special interests in theatre study outside the scope of existing courses. *Preq:* Consent of department head.

VISUAL ARTS (ART)

Professors: J. T. Acorn, *Head;* S. Wang; *Associate Professors:* S. A. Cross, T. Dimond, M. R. Hudson, J. A. Stockham, M. V. Vatalaro; *Visiting Instructors:* A. L. Baldwin, G. W. Leebreck, D. C. Woodward

103 Visual Arts Studio 3(0,6) Studio projects in basic visual elements and principles. The development of creative design process, visual organization, and design skills are introduced as a foundation for further study in visual arts. For non-College of Architecture majors—will not be accepted as credit in College of Architecture curricula.

205 Beginning Drawing 3(0,6) A study of drawing based on the premise that drawing is a foundation discipline in the visual arts. Basic materials and approaches associated with drawing are studied and applied through studio practice, augmented by critiques, demonstrations, and lectures. *Preq:* ART 103 or CA DS 152 or consent of instructor.

207 Beginning Painting 3(0,6) Introduction to the basic materials, methods and techniques of painting. The primary medium used is acrylic and other painting media may also be introduced. Emphasis is placed on the basic skills in painting plus individual creative development. *Preq:* ART 103 or CA DS 152 or consent of instructor.

209 Beginning Sculpture 3(0,6) Studio courses investigating the meaning of sculpture through traditional and nontraditional approaches. Establishes a working knowledge of material and process in several media. Personal expression is encouraged and enhanced by employment of problem-solving techniques. Static, temporal, installation and site specific sculpture will be explored. *Preq:* ART 103 or CA DS 152 or consent of instructor.

211 Beginning Printmaking 3(0,6) Studio course designed to introduce basic techniques of relief printing, intaglio, lithography, silkscreen, and papermaking. Each semester concentrates on two or three of these techniques. Coursework integrates printmaking processes and creativity. *Preq:* ART 103 or CA DS 152 or consent of instructor.

213 Beginning Photography 3(0,6) Introduction to the use of photography as an art medium. Lectures and studio work cover the utilization of the camera, processing and printing in black and white, with emphasis on perception and creative expression. *Preq:* ART 103 or CA DS 152 or consent of instructor.

215 Beginning Graphic Design 3(0,6) Introduction to the fundamental techniques, concepts, and principles of visual communication. Through a series of projects and studio work, students will explore techniques of communication through the use of type design, typography, photography, illustration, symbolism, and product design. Individu-

al creative development will be stressed. *Preq:* ART 103 or CA DS 152 or consent of instructor.

217 Beginning Ceramics 3(0,6) Basic studio course introducing ceramic arts through its various processes and techniques. Hand building methods as well as throwing on the potter's wheel are developed. Weekly projects emphasize imagination, self-expression, and skill development. Ceramic history is introduced through slide lectures. *Preq:* ART 103 or CA DS 152 or consent of instructor.

219 Beginning Papermaking 3(0,6) Designed to explore paper, not just as a surface to receive an image, but as a material capable of being an artistic expression in and of itself. *Preq:* ART 103 or CA DS 152 or consent of instructor.

305 Drawing 3(0,6) Study of human figure drawing with primary emphasis on drawing from live models. The student's drawing skills and fundamental understanding of the structure and form of the human figure are reviewed through studio practice, augmented by critiques, demonstrations, and lectures. *Preq:* ART 205 or consent of instructor.

307 Painting 3(0,6) Continuation of ART 209 with increased emphasis on personal expression and growth in technical competence. Some study of painting history is included in studio activity. *Preq:* ART 207 or consent of instructor.

309 Sculpture 3(0,6) Continuation of ART 209 with increased emphasis on personal expression and content of work. Further exploration of materials and processes including an introduction to foundry casting and advanced welding techniques. Individual investigation into current and historical aspects of sculpture will be required. *Preq:* ART 209 or consent of instructor.

311 Printmaking 3(0,6) Continuation of processes in beginning printmaking with emphasis on expanding the range and depth of technique. The relationship of technique and process to creative idea development is emphasized. *Preq:* ART 211 or consent of instructor.

313 Photography 3(0,6) Continuation of ART 213. Advanced techniques and more diverse types of film and paper are used in making images of personal and expressive nature. The design and construction of a view camera, printing in color, and multiple imagery may also be included. *Preq:* ART 213 or consent of instructor.

315 Graphic Design 3(0,6) Continuation of concepts and techniques introduced in ART 215 with emphasis on more applied projects. Individual creative solutions are emphasized. *Preq:* ART 215 or consent of instructor.

317 Ceramic Arts 3(0,6) Continuation of skill development leading to more challenging projects and independent efforts. Further exposure to ceramic history, and ceramic technology are presented. *Preq:* ART 217 or consent of instructor.

321 Art with the Computer 3(0,6) Studio course using the microcomputer as an art medium. Studies in imaging systems, with emphasis on the creative use of the medium for artistic expression. *Preq:* ART 103 or CA DS 152.

405, 605 Advanced Drawing 3(0,6) Advanced level studies of drawing which explore the synthesis of refined drawing skills and philosophies of art. The student's understanding of drawing as a form of art is developed through studio practice augmented by critiques, demonstrations, lectures, field trips, and independent research. *Preq:* ART 305 or consent of instructor.

407, 607 Advanced Painting 3(0,6) Advanced studio course in painting. Student selects painting media and is expected to develop a strong direction based on prior painting experience. Study of contemporary painters and directions are included. *Preq:* ART 307 or consent of instructor.

409, 609 Advanced Sculpture 3(0,6) Intensive independent studio concentration to further develop personal direction and content. Continued investigation of sculptural context, materials and processes, and relative historical research are emphasized. *Preq:* ART 309 or consent of instructor.

411, 611 Advanced Printmaking 3(0,6) Culmination of process, techniques, and individual development. Students are expected to have mastered process and technique for the benefit of the image produced. Creativity and self-expression are highly empha-

sized as students select a process for concentrated study. *Preq:* ART 311 or consent of instructor.

413, 613 Advanced Photography 3(0,6) Continuation of ART 313. Advanced problems in photography. *Preq:* ART 313 or consent of instructor.

415, 615 Advanced Graphic Design 3(0,6) Continuation of ART 315. Personal expression through communication techniques will be further explored. Individual projects will be emphasized. *Preq:* ART 315 or consent of instructor.

417, 617 Advanced Ceramic Arts 3(0,6) Students are directed toward further development of ideas and skills. Glaze calculation and firing processes are incorporated to allow for a dynamic integration of form and ideas. *Preq:* ART 317 or consent of instructor.

471 Bachelor of Fine Arts Senior Studio I 5(0,15) Individual studio project directed by an instructor and determined by the student in consultation with the instructor. Usually focused upon a particular studio area, concept, or theme. *Preq:* Senior standing and have completed the 300/400 sequence in the discipline in which they choose to complete senior studio.

472 Bachelor of Fine Arts Senior Studio II 5(0,15) Individual studio project directed by an instructor and determined by the student in consultation with the instructor. Usually focused upon a particular studio area, concept, or theme. *Preq:* ART 471, Senior standing.

490, 690 Directed Studies 1-5(0,2-10) Study of areas in the visual arts that are not included in other courses or advanced work in addition to other courses. Directed studies must be arranged with a specific professor prior to registration.

805 Visual Arts Seminar on Theories and Practice I 3(3,0)

806 Visual Arts Seminar on Theories and Practice II 3(3,0)

840 Visual Arts Studio 3-6(0,9-18)

850 Visual Arts Studio 3(0,9)

851 Visual Arts Studio 3-6(0,9)

870 Visual Arts Studio 6(0,16)

871 Visual Arts Studio 3-6(0,8-16)

880 Visual Arts Studio 3-15(0,6-30)

891 Master's Research 3-15(0,6-30)

VOCATIONAL AND TECHNICAL EDUCATION (VT ED)

810 Foundations of Vocational/Technical Education 3(3,0)

812 Vocational and Technical Program Finance 3(3,0)

833 Curriculum Construction in Vocational/Technical Education 3(3,0)

835 Application of Instructional Technology 3(3,0)

850 Programs, Concepts, and Issues in Vocational and Technical Education 3(3,0)

861 Administration and Supervision in Vocational/Technical Education 3(3,0)

863 Adult and Continuing Education 3(3,0)

876 College Teaching 3(3,0)

882 Seminar 1(1,0)

893 Advanced Research Design and Analysis 3(3,0)

980 Internship in Vocational-Technical Education 1-6(0,3-18)

991 Doctoral Research. Credit to be arranged.

WILDLIFE AND FISHERIES BIOLOGY (W F B)

Professors: A. G. Eversole, T. T. Fendley, J. W. Foltz, D. L. Robinette, *Head;* T. E. Schwedler, J. R. Sweeney, J. R. Tomasso, Jr., G. W. Wood; *Associate Professors:* D. L.

Otis, T. E. Lacher, Jr., J. M. Whetstone, G. K. Yarrow; *Assistant Professors:* S. M. Haig, J. J. Isely

101 Introduction to Aquaculture, Fisheries and Wildlife 1(1,0) Informative sketch of aquaculture, fisheries science, and wildlife management. Students are introduced to principles, resources, professional organizations, and careers in these fields. *Preq:* Major in Wildlife and Fisheries Biology or consent of instructor.

102 Methods of Aquaculture, Fisheries and Wildlife Biology 1(0,2) Introduction to methodology used in aquaculture, fisheries science and wildlife management. Students are introduced to terminology, techniques, laws and legislations. Skills with dimensions, units, computations and technical communications as applied to aquaculture, fisheries and wildlife. Open only to Aquaculture, Fisheries and Wildlife majors. *Coreq:* W F B 101.

306 Conservation of Wildlife in the Southeastern United States 2(2,0)F Study of the wildlife and fisheries resources of the Southeastern U.S. including population trends, life histories, and economic importance. Conservation, proper utilization, and protection of endangered species are emphasized. *Preq:* Junior standing or consent of instructor.

307 Hunting and Wildlife Management 1(1,0) Hunting techniques used to harvest renewable wildlife resources are examined with respect to their roles in sound management practices. The effects of selected hunting regulations on wild populations, safety, and ethics are discussed. *Preq:* Junior standing or consent of instructor.

313 (BIOSC) Conservation Biology 3(3,0) Study of the biological bases for the conservation of flora, fauna, and habitats. Biological factors that influence decision-making process will also be addressed. *Preq:* One year of general biology or consent of instructor.

350 Principles of Fish and Wildlife Biology 3(3,0) Introduction to principles of fisheries and wildlife biology on which sound management practices are based. Interrelationships of vertebrate and invertebrate biology, habitat, and population dynamics will be covered. *Preq:* One year of general biology.

412, H412, 612 Wildlife Management 3(2,3) Basic principles and general practices of wildlife management and conservation will be covered. Major problems concerning the management of wildlife resources, with emphasis on upland game species. Laboratory work includes practical work on the Clemson University woodlands and field trips to several areas where wildlife management is being practiced.

414, 614 Wildlife Nutritional Ecology 3(3,0) Concepts of how terrestrial wildlife obtains and utilizes energy and nutrients in wild ecosystems will be taught. Energy and nutrient availability will be discussed in the ecological context of distribution, flow and cycling in natural and modified foraging areas. Physiology of digestion will be discussed for major homeotherms. *Preq:* FOR 415 or WFB 412.

416, 616 Fishery Biology 3(2,3) Principles underlying freshwater fish production. Introduction to major groups of freshwater fishes and their habitats. Topics include identification, age and growth, fecundity, food habits, populations estimation, environmental evaluation, management practices, and fish culture. *Preq:* One year of introductory biology and Junior standing.

450, 650 Aquaculture 3(3,0) Basic aquacultural techniques applied to freshwater and marine organisms; past and present culture of finfishes and shellfishes around the world; principles underlying fish production; water quality, feeding, and nutrition as they influence production of cultured aquatic organisms. *Preq:* One year of general biology and Junior standing.

451, 651 Fish Hatchery Management 3(3,0) Principles of fish hatchery management including hatchery design, water-quality management, fish-health monitoring, fry and fingerling production, genetics, and transport techniques. Hatchery management techniques for sport-fish enhancement and endangered species recovery programs will be emphasized. *Preq:* One year of general chemistry and one year of general biology.

452, 652 Fish Physiology 4(3,3) Course will acquaint fisheries biologists and aquaculturists with the physiology of fish. Nutrition, bioenergetics, reproduction, and water

and ion balance as they relate to fish culture and fisheries management will be emphasized. *Preq:* One year of general biology, one year of general chemistry, and AN PH 301 or consent of instructor.

460, 660 Warmwater Fish Diseases 2(2,0) Study of diseases in warmwater fish including infectious and noninfectious processes. *Preq:* One year of general biology, Junior standing and consent of instructor.

462, H462, 662 Wetland Wildlife Biology 3(3,0) Study of wetland wildlife habitats, emphasizing classification by physical, chemical, and biological characteristics; the importance of wetland habitat for management and production of wetland wildlife species. *Preq:* BIOL 103 and 104; or 110/111.

463 Directed Research in Aquaculture, Fisheries and Wildlife Biology 1(0,3) Research problems in selected areas of aquacultural, fisheries, or wildlife science to introduce the student to experimental design, research techniques, and presentation of research results. May be repeated for a maximum of 3 credits. *Preq:* Junior standing and consent of instructor.

469, H469, 669 (ENT) Aquatic Insects 3(1,6) See ENT 469.

490 Field Training in Aquaculture, Fisheries, and Wildlife 6(0,18) The student, in an eight-to-ten week program, has the opportunity to observe aquaculture, fisheries, or wildlife management. Student will have supervised management responsibility. Total of 270 hours required. Must be prearranged at least two months in advance. To be taken Pass/Fail only. *Preq:* Senior standing in Fisheries and Wildlife Biology and consent of instructor.

493 Selected Topics 1-4(1-4,0) Specialized topics which explore current areas of research and management in either aquaculture, fisheries science, or wildlife management are examined in a lecture/seminar format. May be repeated for credit. *Preq:* Junior standing and consent of instructor.

499 Wildlife Biology and Fisheries Seminar 1(1,0) An exploration of current literature and research in fisheries and wildlife sciences. Students will participate in the analysis of research findings, utilizing skills acquired in their undergraduate programs. May be repeated once for credit.

716 Biology of Fishes for Teachers 3(3,0)

809 Seminar in Wildlife and Fisheries Science 1(1,0)

810 Publishing in Natural Resource Journals 2(2,0)

812 Conservation and Ecology of Endangered Species 3(3,0)

813 Conservation and Ecology of Wildlife in the Tropics 3(3,0)

815 Principles of Wildlife Biology 3(2,3)

816 Applied Wildlife Biology 3(2,3)

818 Waterfowl Ecology and Management 3(2,3)

820 Seminar in Avian Ecology 1(1,0)

830 Estimating Animal Numbers 3(2,3)

840 Fish Management 3(2,3)

860 Diagnostic Fish Disease 2(1,2)

861 Selected Topics 1-4(1-4,0)

863 Special Problems in Wildlife and Fisheries Biology 1-3(0,3-9)

891 Master's Research. Credit to be arranged.

WOMEN'S STUDIES (W S)

Associate Professor: J. M. Melton; *Assistant Professors:* B. Daniell, E. K. Sparks

301 Introduction to Women's Studies: Women's Lives 3(3,0) This interdisciplinary course explores the unique features of women's lives from childhood to old age. Course content is based on new research in many disciplines, including psychology, sociology, history, literature and the arts. *Preq:* Sophomore literature or consent of

instructor.

498 Women's Studies Research and Theory 3(3,0) Focuses on the theoretical foundations for women's studies. Course readings will include essays on interdisciplinary approaches to women's studies, feminist theory, and feminist methodology. Required of Women's Studies minors. *Preq:* W S 301 or consent of instructor.

ZOOLOGY (ZOOL)

Professors: S. A. Gauthreaux, Jr., R. L. Hays, C. W. Helms, J. E. Lilien, G. P. Noblet, E. B. Pivorun, E. E. Ruppert, J. E. Schindler, A. P. Wheeler, J. B. Wourms; *Associate Professors:* J. M. Colacino, D. G. Heckel, R. R. Montanucci, D. W. Tonkyn, D. G. Yardley

301, H301 Comparative Vertebrate Anatomy 4(3,3) A comparative and phylogenetic study of the gross morphology of vertebrates. *Preq:* BIOL 104 or 111.

403, H403, 603 Protozoology 3(3,0) A survey of the protozoa with emphasis on organization and function. Representative types of both free-living and parasitic forms will be examined for each major taxon. *Preq:* BIOL 104 or 111.

404, 604 Protozoology Laboratory 1(0,3) Laboratory exercises will reinforce the material presented in ZOOL 403 and will introduce students to techniques used in collection, preservation, and examination of protozoans. *Preq:* ZOOL 403.

405, H405, 605 Animal Histology 4(3,3) A structural and functional study of the basic tissues of animals and the tissue makeup of organs. Mammalian histology is stressed but comparative histology will be incorporated. The course is directed toward study at the light microscope level. Detailed study of selected cells will utilize electron micrographs. *Preq:* BIOSC 303 or consent of instructor.

410, H410, 610 Limnology 4(3,3) Adetailed introduction to the physical, chemical, and biological interrelationships that characterize inland water environments. A fundamental approach to the interactions of components of the environment is developed at the theoretical level. Field and laboratory instruction in techniques of analysis are utilized to illustrate applications of theoretical concepts. *Preq:* BIOSC 302 or 303, General Chemistry.

421, 621 Seminar in Invertebrate Zoology 4(3,3) The course will consider advanced topics in invertebrate zoology. Content will vary in successive years and students may enroll more than once for credit with consent of instructor. Laboratory includes benchwork, several field trips to the South Carolina coast and one to the Florida Keys over spring break.

450, H450, 650 Comparative Vertebrate Embryology 4(3,3) A comparative study of the developing vertebrate body from fertilization through organogenesis. Patterns of reproduction and embryonic development, morphogenesis, organogenesis, and the functional differentiation of cells and tissues will be considered. *Preq:* Consent of instructor.

456, H456, 656 Medical and Veterinary Parasitology 4(3,3) Introduction to parasitism in the animal kingdom with emphasis on both basic and applied principles as they relate to economically and medically important diseases. Classical and experimental approaches to the study of parasitism are examined in reference to protozoa, helminths, and arthropods. *Preq:* BIOL 104 or 111.

457, H457, 657 Comparative Physiology 4(3,3) A comparative study of physiological processes throughout the animal kingdom. Laboratories will introduce the use of basic instrumentation and will provide an opportunity to perform original experiments. *Preq:* BIOCH 301 or consent of instructor.

459, H459, 659 Systems Physiology 4(3,3) Physiological systems (neural, muscular, skeletal, endocrine, circulatory, respiratory, digestive, and excretory) of vertebrates and their homeostatic controls. *Preq:* BIOSC 303 or consent of instructor.

462, 662 Herpetology 3(2,3) Systematics, life history, distribution, ecology, and current literature of amphibians and reptiles. Laboratory study of morphology and identification of world families, and U.S. genera, as well as all southeastern species. Field trips will be required. *Preq:* BIOSC 303 or consent of instructor.

463, 663 Ichthyology 3(2,3) Systematics, life history, distribution, ecology, and current literature of fish. Laboratory study of morphology and identification of U.S. genera, as well as all southeastern species. Field trips will be required. *Preq:* BIOSC 303 or consent of instructor.

464, 664 Mammalogy 3(2,3) Origin, evolution, distribution, structure, and function of mammals, with laboratory emphasis on the mammals of South Carolina. Field Collection required. *Preq:* BIOSC 303 or consent of instructor.

465, 665 Ornithology 4(3,3) The biology of birds: their origin and diversification, adaptations, phylogeny, classification, structure and function, behavior, ecology, and biogeography. Field identification is emphasized and field trips are required. *Preq:* BIOSC 303 or consent of instructor.

470, H470, 670 Animal Behavior 3(3,0) Historical and modern developments in animal behavior emphasizing the evolutionary and ecological determinants of behavior. A synthesis of ethology and comparative psychology. *Preq:* BIOSC 302 or 303 or consent of instructor.

471, 671 Animal Behavior Laboratory 1(0,3) Laboratory exercises that explore the behavior of animals. Emphasis is on behavioral observation and analysis and presentation of findings in a report format. *Preq:* BIOSC 303, ZOOL 470, or consent of instructor.

475, 675 Vertebrate Endocrinology 3(3,0) Introduction to the basic principles of neuroendocrine integration and homeostatic maintenance in vertebrates. Comparative morphology and physiology of various endocrine tissues and hormone chemistry and modes of action are considered. *Preq:* BIOSC 302 or 303, organic chemistry, or consent of instructor.

493 Undergraduate Seminar 1(1,0) Exploration of current zoological literature. *Preq:* Senior standing.

803 Population Dynamics 4(2,6)

810 Behavioral Ecology 3(3,0)

812 Seminar 1(1,0)

815 Physiological Ecology 4(3,3)

816 Advanced Ecosystem Analysis I 4(3,3)

818 Community Ecology 4(3,3)

835 Interpretative Electron Microscopy 3(3,0)

863 Special Problems 1-4

891 Master's Research. Credit to be arranged.

991 Doctoral Research. Credit to be arranged.

Faculty

Abbott, Albert Glenn, *Associate Professor of Biochemistry.* BS, University of Connecticut, 1976; PhD, Brown University, 1980

Abernathy, Atwell Ray, *Acting Head and Professor of Environmental Systems Engineering.* BA, Lenoir-Rhyne College, 1953; MSPH, 1959, PhD, 1963, University of North Carolina

Abraham, John Harwood, *Instructor in Management.* BS, Virginia Polytechnic Institute and State University, 1973; MS, Webster University, 1983

Abramovitch, Rudolph Abraham, *Professor of Chemistry.* BS, Alexandria University, 1950; PhD, King's College, 1953; DSc, University of London, 1964

Acorn, John Thomson, *Head and Professor of Visual Arts and History.* BA, Montclair State College, 1959; MFA, Cranbrook Academy of Art, 1961

Acton, James Crockett, *Stender Professor of Food Science.* BS, 1965, PhD, 1970, University of Georgia

Adams, Clementina Rodriguez, *Assistant Professor of Spanish.* BA, Atlantico University (Colombia), 1969; MS, 1974, PhD, 1984, Florida State University

Adams, Craig David, *Assistant Professor of Environmental Systems Engineering.* BS, 1983, MS, 1988, PhD, 1991, University of Kansas

Adams, Minerva Rios, *Lecturer in Mathematical Sciences.* BS, University of Puerto Rico, 1978; MS, Virginia Polytechnic Institute and State University, 1982

Adams, Warren Philip, *Associate Professor of Mathematical Sciences.* BS, Lewis University, 1979; MS, 1981, PhD, 1984, Virginia Polytechnic Institute and State University

Addison, Clarence Lee Benjamin, *Professor of Construction Science.* BArch, Howard University, 1959; MArch, Clemson University, 1974

Adler, Peter Holdridge, *Associate Professor of Entomology.* BS, Washington and Lee University, 1976; MS, 1979, PhD, 1983, Pennsylvania State University

Aitken, James Bruce, *Professor of Horticulture, Sandhill Research and Education Center.* BS, 1962, MS, 1964, Clemson University; PhD, University of Florida, 1967

Alam, Kursheed, *Professor of Mathematical Sciences.* BS, 1941, MS, 1943, Patna Science College; PhD, University of Minnesota, 1963

Alberts, James Joseph, *Adjunct Professor of Zoology.* BA, Cornell College, 1965; MS, Dartmouth College, 1967; PhD, Florida State University, 1970

Albrecht, John Ernest, *Professor of Animal Science, Pee Dee Research and Education Center.* BS, Delaware Valley College, 1965; MS, 1968, PhD, 1971, North Carolina State University

Alexander, John Calvin, Jr., *Assistant Professor of Finance.* BBA, 1984, MBA, 1985 Stetson University; PhD, Florida State University, 1991

Alexander, Marvolyn Demetria, *Instructor in Architecture.* BLA, Louisiana State University, 1990

Alexander, Ronald Carter, *Director of Wellness Program; Lecturer in Nursing.* BS, St. Cloud State College, 1957; MA, Northern Colorado University, 1964

Allen, Benjamin Louis, Jr., *Adjunct Professor of Bioengineering.* BS, Wofford College, 1960; MD, Duke University, 1964

Allen, Lawrence Robert, *Head and Professor of Parks, Recreation, and Tourism Management.* BS, West Chester State University, 1970; MS, 1974, PhD, 1979, University of Maryland

Allen, William Harold, *Professor of Agricultural Engineering.* BS, 1966, MS, 1969, Clemson University; PhD, University of Tennessee, 1972; PE

Alley, Pamela Renee, *Visiting Assistant Professor of Psychology.* BA, 1975, MA, 1978, PhD, 1983, University of Connecticut

Alley, Thomas Robertson, *Professor of Psychology.* BA, BS, Pennsylvania State University, 1975; MA, 1979, PhD, 1981, University of Connecticut

Allison, David John, *Associate Professor of Architecture.* BS, 1978, MArch, 1982, Clemson University

Alphin, John Gilbert, *Professor of Agricultural Engineering, Pee Dee Research and Education Center.* BS, 1960, MS, 1962, PhD, 1965, North Carolina State University

Alverson, David Roy, *Professor of Entomology.* BS, 1968, MS, 1976, Clemson University; PhD, University of Georgia, 1979

Amirkhanian, Serji, *Assistant Professor of Civil Engineering.* BS, 1979, MS, 1981, Tennessee Technological University; PhD, Clemson University, 1987

Anand, Subhash Chandra, *Professor of Civil Engineering.* BS, Banaras Hindu University (India), 1955; MS, 1965, PhD, 1968, Northwestern University; PE

Anand, Vera Barata, *Associate Professor of Engineering Graphics.* BS, University of Para (Brazil), 1961; MS, Northwestern University, 1966

Andreas, James Robert, *Head and Professor of English.* BA, Northwestern University, 1965; MA, The Johns Hopkins University, 1966; PhD, Vanderbilt University, 1973

Anderson, Vicki Truluck, *Adjunct Assistant Professor of Medical Technology, McLeod Regional Medical Center.* BS, University of Tampa, 1972

Anessi, Thomas J, *Adjunct Associate Professor of Civil Engineering.* BS, Catholic University of America, 1956; MS, University of Michigan, 1961; PhD, University of Oklahoma, 1970

Appling, Jeffrey Robert, *Assistant Professor of Chemistry.* BS, 1980; PhD, 1985, Georgia Institute of Technology

Arbena, Joseph Luther, *Professor of History.* BA, George Washington University, 1961; PhD, University of Virginia, 1970

Armstrong, Lindsley Farrar, *Instructor in Speech.* BA, 1986, MA, 1989, University of West Florida

Arnold, Edwin Pratte, *Associate Professor of German.* BA, University of South Carolina, 1958; MA, Kent State University, 1968

Askew, George Robert, Jr., *Professor of Forest Resources; Director of Belle W. Baruch Forest Science Institute.* BS, 1976, MS, 1978, PhD, 1981, Clemson University

Aspland, John Richard, *Professor of Textiles.* BS, 1958, MS, 1960, Leeds University; PhD, Manchester University, 1964

Astle, Deana Lee, *Acting Assistant Dean; Associate Librarian.* BA, Brown University, 1967; MLS, University of California, 1968; MA, University of Utah, 1976

Aziz, Nadim Mahmoud, *Associate Professor of Civil Engineering and Engineering Graphics.* BSCE, 1978, MS, 1980, PhD, 1984, University of Mississippi

Babel, Deborah Byrne, *Assistant Dean and Department Head; Assistant Librarian.* BA, Wells College, 1968; MSLS, University of North Carolina, 1976; MBA, Western Washington University, 1989

Backman, Sheila Jane, *Assistant Professor of Parks, Recreation, and Tourism Management.* BSC, 1977, MR, 1979, Acadia University (Canada); PhD, Texas A&M University, 1988

Badr, Abdel Wahed, *Adjunct Assistant Professor of Agricultural and Biological Engineering.* BS, Alexandria University (Egypt), 1968; MS, 1978; PhD, North Carolina State University, 1983

Bagby, Sara Ayers, *Professor of Home Economics.* BS, Georgia College, 1954; MS, 1957, PhD, 1974, University of Georgia

Bagchi, Amit, *Assistant Professor of Mechanical Engineering.* BTech, Indian Institute of Technology (Kharagpur), 1975; MScE, University of New Brunswick (Canada), 1977; PhD, Carnegie-Mellon University, 1983

Bainbridge, Robert Warin, *Visiting Assistant Professor of Planning.* BArch, Clemson University, 1970; MArch, Rice University, 1978

Baird, William Vance, *Assistant Professor of Horticulture.* BS, Oregon State University, 1976; MA, Miami University, 1979; PhD, University of Virginia, 1983

Baker, Rees Terence Keith, *Adjunct Professor of Chemical Engineering.* ARIC, 1963, ACT, 1964, Liverpool Polytechnic; PhD, University of Wales, 1966

Balch, Clarence Almus, *Lecturer in Engineering Graphics.* BS, California Polytechnic State University, 1959

Baldwin, Aaron Leland, *Visiting Instructor in Art.* BS, 1988, MFA, 1991, Clemson University

Ballard, Robert Edward, *Associate Professor of Botany.* BS, 1966, MA, 1968, Miami University; PhD, University of Iowa, 1975

Barbary, Shelley White, *Assistant Professor of Education.* BS, 1968, PhD, 1974, Clemson University

Barefoot, Susan Ferguson, *Associate Professor of Food Science and Microbiology.* BS, 1971, MS, 1979, PhD, 1984, North Carolina State University

Barfield, Rayford Elliott, Jr., *Associate Professor of English.* BA, LaGrange College, 1961; MA, University of Georgia, 1963; PhD, University of Tennessee, 1969

Bargeron, Jefferson Davis III, *Adjunct Assistant Professor of Agricultural and Biological Engineering.* BS, North Georgia College, 1969; MS, 1972, PhD, 1989, Clemson University

Barker, James Frazier, *Dean, College of Architecture; Professor of Architecture.* BArch, Clemson University, 1970; MArch, Washington University, 1973; AIA

Barkley, David Lane, *Professor of Agricultural and Applied Economics.* BA, Furman University, 1969; MA, University of Georgia, 1972; PhD, Iowa State University, 1976

Barlage, William Berdell, Jr., *Associate Dean, College of Engineering; Professor of Chemical Engineering.* BS, Lehigh University, 1954; MChE, University of Virginia, 1955; PhD, North Carolina State University, 1960

Barmore, Charles Rice, *Adjunct Professor of Food Science.* BS, Clemson University, 1966; MS, 1969,

PhD, 1972, University of Florida

Barnhart, Scott Wesley, *Associate Professor of Finance.* BS, 1978, MS, 1980, Florida State University; PhD, Texas A&M University, 1984

Baron, William, *Associate Professor of Civil Engineering.* BSCE, City College of New York, 1960; MSCE, 1963, PhD, 1966, Purdue University; PE

Barrett, David Elm, *Associate Professor of Education.* BA, Wesleyan University, 1969; MS, 1973, PhD, 1974, University of Southern California

Barron, Charles Henson, Jr., *Head and Professor of Chemical Engineering.* BS, Clemson University, 1959; DSc, University of Virginia, 1963

Barron, Felix Hector, *Assistant Professor of Food Science.* BS, University of Chihuahua (Mexico) 1972; MS, University of Rome (Italy) 1975; MS, Washington State University, 1982; PhD, Michigan State University, 1990

Barton, Marlin Collins III, *Visiting Instructor in English.* BS, University of Alabama, 1985; MFA, Wichita State University, 1990

Barton, William Eugene, *Visiting Assistant Professor of Entomology.* BS, 1984, PhD, 1989, Clemson University

Bathke, Glenn Randal, *Assistant Professor of Agronomy and Soils.* BS, University of Wisconsin, 1980; MS, University of Minnesota, 1983; PhD, North Carolina State University, 1989

Bauer, Larry Lee, *Professor of Agricultural and Applied Economics.* BS, University of Illinois, 1961; MS, Purdue University, 1963; PhD, North Carolina State University, 1968

Bauer, Philip, *Adjunct Assistant Professor of Agronomy and Soils.* BS, 1979, BS, 1982, MS, 1985, University of Wisconsin; PhD, Texas A&M University, 1988

Bauknight, Charles William, Jr., *Visiting Assistant Professor of Chemistry.* BA, Duke University, 1981; PhD, Clemson University, 1987

Baum, Carl William, *Assistant Professor of Electrical and Computer Engineering.* BS, University of California, 1987; MS, 1989, PhD, 1992 University of Illinois

Bautista, Gloria, *Assistant Professor of Spanish.* BA, Javeriana University (Colombia), 1968; MA, 1975, PhD, 1987, State University of New York

Baxa, Ernest Granville, Jr., *Associate Professor of Electrical and Computer Engineering.* BEE, University of Virginia, 1962; MSEE, 1968, PhD, 1970, Duke University

Beard, John Nelson, Jr., *Professor of Chemical Engineering.* BS, University of South Carolina, 1958; MS, 1970, PhD, 1971, Louisiana State University

Bearden, Daniel Wesley, *Lecturer/Spectroscopist in Chemistry.* BS, Southern Methodist University, 1980; MA, 1983, PhD, 1987, Rice University

Beardsley, Mary Elizabeth, *Visiting Instructor in English.* BA, Erskine College, 1990; MA, Clemson University, 1992

Beasley, Donald Erwin, *Associate Professor of Mechanical Engineering.* BS, 1978, MS, 1980, Clemson University; PhD, University of Michigan, 1983

Becker, Elizabeth Marie, *Visiting Assistant Professor of Economics.* BA, University of Wisconsin, 1982; MA, 1985, PhD, 1989, Clemson University

Becker, Robert Henry, *Director of Strom Thurmond Institute; Professor of Parks, Recreation, and Tourism Management.* BS, Pennsylvania State University, 1970; MA, 1973, PhD, 1976, University of Maryland

Beckerle, John David, *Assistant Professor of Physical Chemistry in Chemistry.* BS, McGill University, 1981; PhD, Massachusetts Institute of Technology, 1988

Beckwith, William Frederick, *Professor of Chemical Engineering.* BS, 1957, MS, 1961, PhD, 1963, Iowa State University; PE

Bednar, John Clay, *Associate Professor of French.* BA, Princeton University, 1965; PhD, University of Besancon (France), 1969

Behery, Hassan Mohamad, *Professor of Textiles.* BS, 1950, MS, 1955, Alexandria University; PhD, University of Manchester, 1959; CText; FTI

Belcher, Cynthia Leahy, *Assistant Professor of Nursing Science.* BSN, University of Miami, 1969; MN, Emory University, 1971

Bell, Lansford Charles, *S. E. Liles Distinguished Professor of Construction Engineering.* BS, 1965, MS, 1968, University of Maryland; PhD, Vanderbilt University, 1972, PE

Bellinger, Robert Glenn, *Visiting Assistant Professor of Entomology.* BS, 1974, MS, 1979, University of Maryland; PhD, Virginia Polytechnic Institute and State University, 1985

Bender, Renet Lovorn, *Lecturer in Computer Science.* BS, 1979, MS, 1986, Louisiana State University; PhD, University of Georgia, 1992

Benjamin, Daniel Kelly, *Professor of Economics.* BA, University of Virginia, 1969; MA, 1971, PhD, 1975, University of California

Bennett, Alma, *Assistant Professor of English.* BM, Belhaven College, 1962; MS, Radford University,

1974; PhD, University of Texas, 1991

Bennett, Archie Wayne, *Professor of Electrical and Computer Engineering.* BS, 1960, MS, 1963, Virginia Polytechnic Institute and State University; PhD, University of Florida, 1966; PE

Bennett, John Everett, *Associate Professor of Electrical and Computer Engineering.* BSEE, 1958, MSEE, 1968, PhD, 1970, University of Tennessee

Bens, Catherine Mary, *Lecturer of Environmental Toxicology.* BS, Miami University, 1980; MS, Western Washington University, 1990

Benson, Christopher Allen, *Instructor in English.* BA, 1987, MA, 1990, Clemson University

Benson, Sally Merrick, *Visiting Associate Professor of Geology.* BA, Columbia University, 1987; MS, 1984, PhD, 1988, University of California

Berger, Leonard, *Professor of Psychology.* AB, 1968, MA, 1969, PhD, 1972, Temple University

Bernhard, Philip Joseph, *Assistant Professor of Computer Science.* BA, 1984, MS, 1987, PhD, 1988, State University of New York

Bertrand, Jean Ann, *Associate Professor of Dairy Science.* BS, University of Missouri, 1980; MS, Iowa State University, 1983; PhD, University of Georgia, 1987

Beyerlein, Adolph Louis, *Professor of Chemistry.* BS, Fort Hays Kansas State College, 1960; PhD, University of Kansas, 1966

Bibilnieks, Tracy Ann, *Lecturer in Mathematical Sciences.* BA, Saint Olaf College, 1985; MS, Clemson University, 1987

Biggers, Sherrill Bost, *Associate Professor of Mechanical Engineering and Engineering Mechanics.* BSCE, North Carolina State University, 1966; MS, 1970, PhD, 1971, Duke University; PE

Bingenheimer, Kirt Alan, *Visiting Assistant Professor of Construction Science.* BA, Michigan State University, 1987; MCSM, Clemson University, 1991

Birrenkott, Glenn Peter, Jr., *Professor of Poultry Science.* BS, 1973, MS, 1975, PhD, 1978, University of Wisconsin

Bishop, Eugene Harlan, *Professor of Mechanical Engineering.* BS, Mississippi State University, 1955; PhD, University of Texas, 1964

Bismack, Thaddeus Robert, *Lecturer in Accounting.* BS, Central Michigan University, 1959; MBA, University of Michigan, 1960; CPA; CMA

Bjorkengren, Carl-Arel, *Adjunct Assistant Professor of Packaging Science.* MS, Chalmers Technological University (Sweden)

Black, Donald Burdette, *Adjunct Associate Professor of Chemistry.* BS, University of Illinois, 1933

Black, Jonathan, *Hunter Professor of Bioengineering.* BS, Cornell University, 1961; ME, Pennsylvania State University, 1963; PhD, University of Pennsylvania, 1972

Blackbourn, Richard Lee, *Head of Elementary and Secondary Education Department; Professor of Education.* BS, 1974, MS, 1976, EdD, 1983, Mississippi State University

Blackburn, Jeanette Craig, *Lecturer in Accounting.* BS, 1982, MPAcc, 1988, Clemson University

Blair, Dudley Wayne, *Director of Master of Business Administration Program; Professor of Economics.* BS, 1970, PhD, 1975, Texas A&M University

Blake, James Howard, *Extension Associate of Plant Pathology and Physiology.* BS, Tennessee Technological University, 1982; MS, University of Arkansas, 1984

Blanton, Lloyd Houston, *Professor of Agricultural Education.* BS, 1961, MAgEd, 1968, Clemson University; PhD, Ohio State University, 1970

Bleser, Carol, *Calhoun and Kathryn Lemon Professor of History.* BA, Converse College, 1960; MA, 1961, PhD, 1966, Columbia University

Blodgett, Jack Comly, *Research Associate/Assistant Professor of English.* BS, Pennsylvania State University, 1967; MA, University of Connecticut, 1971

Bodenheimer, Lisa, *Assistant Librarian.* BA, Mercer University, 1980; MAT, Vanderbilt University, 1983; MLS, Indiana University, 1986

Bodine, Ashby Burgess II, *Professor of Dairy Science.* BA, 1969, MS, 1975, PhD, 1978, Clemson University

Boerckel, Susan Denise, *Assistant Professor of English.* BA, Queens College, 1980; MA, University of Tennessee, 1984; PhD, State University at Stoney Brook, 1988

Book, Norman Loyd, *Professor of Construction Science.* BAE, 1955, MEngr, 1967, PhD, 1973, Pennsylvania State University; AIA, PE

Boon, William Bennett, *Visiting Assistant Professor of Philosophy.* BA, St. John's College, 1980; MA, 1987, PhD, 1991, University of Texas

Boone, William, *Adjunct Professor of Animal Physiology.* BS, University of Georgia, 1970; MS, 1972, PhD, 1977, Clemson University

Bose, Anil Kumar, *Associate Professor of Mathematical Sciences.* BS, 1948, MS, 1956, Calcutta University; PhD, University of North Carolina, 1964

Botchway, Portia Anita, *Lecturer in Nursing Science.* BSN, Hampton Institute, 1975; MS, University of Maryland, 1979

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Agricultural Economics and Rural Sociology	12	0	0	0
Agricultural and Applied Economics	0	8	0	0
Agricultural Education	5	8	0	0
Agricultural Mechanization and Business	8	0	0	0
Agriculture	0	1	0	0
Agronomy	3	2	0	2
Animal and Food Industries	0	5	0	0
Animal Industries	28	0	0	0
Animal Physiology	0	1	0	3
Applied Economics	0	0	0	3
Aquaculture, Fisheries, and Wildlife Biology	13	7	0	0
Entomology	1	2	0	1
Environmental Toxicology	0	5	0	0
Food Science	9	0	0	0
Food Technology	0	0	0	2
Horticulture	11	1	0	0
Nutrition	0	1	0	4
Packaging Science	8	0	0	0
Plant Pathology	0	0	0	1
Plant Physiology	0	0	0	2
Preprofessional Studies	1	0	0	0
Wildlife Biology	0	1	0	0
Total	99	42	0	18
College of Architecture				
Architecture	0	35	0	0
Construction Science and Management	40	8	0	0
City and Regional Planning	0	21	0	0
Design	84	0	0	0
Fine Arts	9	6	0	0
Total	133	70	0	0
College of Commerce and Industry				
Accounting	116	28	0	0
Business Administration	0	231	0	0
Economics	50	14	0	0
Financial Management	212	0	0	0
Industrial Management	38	27	0	1
Management	228	0	0	0
Management Science	0	0	0	0
Marketing	178	0	0	0
Textile Chemistry	3	1	0	0
Textile Management	24	0	0	0
Textile and Polymer Science	0	0	0	1
Textile Science	2	2	0	0
Textile Technology	1	0	0	0
Total	852	303	0	2
College of Education				
Administration and Supervision	0	19	0	0
Counseling and Guidance Services	0	65	0	0
Early Childhood Education	41	0	0	0
Education	0	0	8	0
Elementary Education	122	37	0	0
Graphic Communications	21	0	0	0
Human Resource Development	0	18	0	0
Industrial Education	17	22	0	0
Mathematics Teaching	14	0	0	0
Reading	0	13	0	0
Science Teaching	19	0	0	0
Secondary Education	66	16	0	0
Special Education	3	11	0	0
Vocational and Technical Education	0	0	0	6
Total	303	201	8	6

	Bachelors'	Masters'	Specialists'	Doctors'
College of Engineering				
Agricultural Engineering	10	5	0	2
Bioengineering	0	15	0	4
Ceramic Engineering	41	2	0	3
Chemical Engineering	37	6	0	2
Civil Engineering	99	20	0	2
Computer Engineering	24	10	0	0
Electrical Engineering	117	21	0	8
Engineering	0	24	0	0
Engineering Analysis	7	0	0	0
Engineering Mechanics	0	4	0	2
Environmental Systems Engineering	0	37	0	2
Industrial Engineering	64	8	0	4
Mechanical Engineering	133	41	0	2
PreProfessional Studies	1	0	0	0
Total	533	193	0	31
College of Forest and Recreation Resources				
Forest Products	3	0	0	0
Forest Resource Management	16	0	0	0
Forest Resources	0	11	0	4
Parks, Recreation, and Tourism Management	94	9	0	1
Total	113	20	0	5
College of Liberal Arts				
Economics and Political Science	2	0	0	0
English	65	25	0	0
English and French	2	0	0	0
English and History	1	0	0	0
English and Political Science	3	0	0	0
English and Secondary Education	1	0	0	0
French and Political Science	1	0	0	0
History	24	5	0	0
History and Political Science	2	0	0	0
History and Psychology	3	0	0	0
Language and International Trade	53	0	0	0
Modern Languages	9	0	0	0
Philosophy	2	0	0	0
Physics and Politcal Science	1	0	0	0
Political Science	70	0	0	0
Psychology	76	10	0	0
Psychology and Sociology	1	0	0	0
Sociology	31	0	0	0
Total	347	40	0	0
College of Nursing				
Nursing	67	11	0	0
Total	67	11	0	0
College of Sciences				
Biochemistry	13	1	0	3
Biological Sciences	54	0	0	0
Botany	0	1	0	0
Chemistry	13	9	0	9
Chemistry and English	1	0	0	0
Computer Information Systems	17	0	0	0
Computer Science	33	34	0	0
Geology	1	0	0	0
Mathematical Sciences	36	15	0	6
Medical Technology	4	0	0	0
Microbiology	22	3	0	1
Physics	4	5	0	1
Preprofessional Studies	1	0	0	0
Zoology	0	2	0	11
Total	199	70	0	31
Total Degrees Awarded 1991-1992	2,646	950	8	93

Grand Total Degrees Awarded 1991-1992 3,697

TOTAL DEGREES AWARDED BY MAJOR COURSE, 1896-1992

The enrollment of Clemson has grown from 446 students at the opening of the University in 1893, to 17,666 for the first semester, 1992-93. Since the opening of the University, 62,249 students have been awarded the Bachelor's degree. During this same period, 426 Associate degrees, 14,863 Master's degrees, 1,281 Doctor of Philosophy degrees, 41 Doctor of Education degrees, and 174 Education Specialist degrees have been awarded. A total of 79,034 degrees have been awarded by Clemson University.

Major Course	
ASSOCIATES	
Nursing	426
Total Associate Degrees Awarded	426
BACHELORS	
Accounting	1,306
Administrative Management	2,446
Agricultural Chemistry	102
Agricultural Economics	486
Agricultural Economics and Rural Sociology	135
Agricultural Education	706
Agricultural Engineering	654
Agricultural Mechanization and Business	202
Agriculture	244
Agriculture and Animal Industry	80
Agriculture and Chemistry	69
Agronomy	850
Animal Industries	501
Animal Science	913
Applied Mathematics	34
Aquaculture, Fisheries and Wildlife Biology	54
Architectural Engineering	118
Architecture	740
Arts and Sciences	2,542
Bachelor of Science	3
Biochemistry	139
Biological Sciences	156
Biology	301
Botany	63
Building Construction	306
Building Science	35
Building Science and Management	260
Ceramic Engineering	640
Chemical Engineering	1,276
Chemistry	619
Chemistry Engineering	70
Chemistry and English	1
Chemistry and Geology	11
Chemistry and German	1
Chemistry and History	1
Civil Engineering	3,012
Community and Rural Development	11
Computer Engineering	443
Computer Information Systems	166
Computer Science	552
Construction Science and Management	40
Dairy Science	427
Design	904
Early Childhood Education	818
Economic Biology	178
Economics	673
Economics and French	6
Economics and History	1
Economics and Political Science	13
Economics and Spanish	6
Education	242
Electrical Engineering	3,657
Elementary Education	2,046
Engineering Analysis	110
Engineering Industrial Education	70
Engineering Technology	694
English	746
English and French	2
English and History	19
English and Mathematical Sciences	1
English and Political Science	17
English and Psychology	1
English and Secondary Education	1
English and Sociology	1
English and Spanish	5
Entomology	180
Financial Management	1,944
Fine Arts	21
Food Science	167
Forest Management	432
Forest Products	18
Forest Resource Management	32
Forestry	288
French and History	2
French and Political Science	12
French and Psychology	1
French and Spanish	1
General Science	359
Geology	140
German and History	1
German and Political Science	3
German and Psychology	1
Graphic Communications	179
History	265
History and Philosophy	1
History and Political Science	8
History and Psychology	4
History and Secondary Education	1
Horticulture	689
Industrial Education	1,045
Industrial Engineering	396
Industrial Management	2,216
Industrial Physics	56
Language and International Trade	160
Management	1,258
Marketing	588
Mathematical Sciences	657
Mathematics	229
Mathematics Teaching	14
Mechanical and Electrical Engineering	489
Mechanical Engineering	3,471
Medical Technology	158
Metallurgical Engineering	20
Microbiology	632
Modern Languages	206
Nursing	1,285
Packaging Science	12
Parks, Recreation, and Tourism Management	660
Philosophy	2
Physics	222
Physics and Political Science	1
Plant Sciences	517
Political Science	793

Political Science and Psychology..... 1
Political Science and Sociology..... 1
Political Science and Spanish..... 5
Poultry Science..... 59
Prearchitecture..... 407
Premedicine..... 756
Preprofessional Studies..... 221
Psychology..... 863
Psychology and Sociology..... 5
Psychology and Spanish..... 2
Recreation and Park Administration..... 1,223
Science Teaching..... 474
Secondary Education..... 1,389
Secondary Education and English..... 1
Secondary Education and History..... 2
Secondary Education and Spanish..... 1
Sociology..... 443
Soils..... 9
Special Education..... 4
Textile Chemistry..... 422
Textile Engineering..... 1,060
Textile Industrial Education..... 85
Textile Management..... 401
Textile Manufacturing..... 1,045
Textile Science..... 94
Textile Technology..... 210
Textiles..... 35
Veterinary Science..... 16
Vocational Agricultural Education..... 729
Weaving and Design..... 42
Wood Utilization..... 52
Zoology..... 512

DOUBLE MAJORS

Agricultural Chemistry and Arts and Sciences..... 1
Agricultural Chemistry and General Science..... 1
Agricultural Economics and Animal Husbandry..... 1
Agricultural Economics and Vocational Agricultural Education..... 1
Agricultural Engineering and Civil Engineering..... 2
Agricultural Engineering and Electrical Engineering..... 1
Agricultural Engineering and Mechanical Engineering..... 1
Agronomy and Agricultural Education..... 1
Agronomy and Vocational Agricultural Education..... 4
Animal Husbandry and Agricultural Education..... 3
Animal Husbandry and Ceramic Engineering..... 1
Animal Husbandry and Dairy..... 2
Animal Husbandry and Industrial Management..... 1
Animal Husbandry and Vocational Agricultural Education..... 5
Architectural Engineering and Architecture, five-year..... 1
Architecture and Architectural Engineering..... 11
Architecture and Civil Engineering..... 1
Architecture, four-year, and Architecture five-year..... 18
Architecture, four-year and Mechanical Engineering..... 1
Arts and Sciences and Agricultural Economics..... 1
Chemical Engineering and Chemistry and Chemistry Engineering..... 3
Chemical Engineering and Chemistry Engineering..... 1
Chemistry and Agricultural Chemistry..... 1
Chemistry and Chemical Engineering..... 1
Chemistry and Chemistry Engineering..... 1
Chemistry and General Science..... 1
Chemistry and Industrial Physics..... 1
Civil Engineering and Architecture..... 1
Civil Engineering and Chemistry and Geology..... 2
Civil Engineering and Electrical Engineering..... 1
Civil Engineering and Industrial Physics..... 1
Civil Engineering and Mechanical Engineering..... 1
Electrical Engineering and Applied Mathematics..... 1
Electrical Engineering and Industrial Physics..... 1
Electrical Engineering and Mechanical Engineering..... 17
Electrical Engineering and Textile Engineering..... 1
Entomology and Architecture, five-year..... 1
Entomology and Premedicine..... 1
General Science and Ceramic Engineering..... 1
General Science and Education..... 1
General Science and Electrical Engineering..... 1
Horticulture and Agronomy..... 1
Horticulture and Architectural Engineering..... 1
Horticulture and Civil Engineering..... 1
Industrial Education and Architecture..... 1
Industrial Education and Electrical Engineering..... 1
Industrial Education and Forestry..... 1
Industrial Engineering and Mechanical Engineering..... 1
Mechanical Engineering and Textile Engineering..... 4
Poultry and Vocational Agricultural Education..... 1
Premedicine and Arts and Sciences..... 1
Premedicine and Textile Chemistry..... 2
Textile Chemistry and Civil Engineering..... 1
Textile Chemistry and Textile Manufacturing..... 1
Textile Engineering and Civil Engineering..... 1
Textile Engineering and Mechanical and Electrical Engineering..... 1
Textile Engineering and Textile Industrial Education..... 1
Textile Engineering and Textile Manufacturing..... 1
Textile Engineering and Weaving and Designing..... 1
Textile Manufacturing and Mechanical Engineering..... 1

Total Bachelors' Degrees Awarded..... 61,452

MASTERS

Accounting..... 137
Agricultural and Applied Economics..... 8
Agricultural Economics..... 165
Agricultural Education..... 303
Agricultural Engineering..... 76

Agriculture..... 203
Agronomy..... 99
Animal and Food Industries..... 123
Animal Physiology..... 2
Animal Science..... 48
Applied Psychology..... 22
Aquaculture, Fisheries, and Wildlife Biology..... 29
Architecture..... 572
Bacteriology..... 6
Biochemistry..... 41
Bioengineering..... 166
Botany..... 40
Building Science and Management..... 14
Business Administration 1,010
Ceramic Engineering..... 139
Chemical Engineering..... 174
Chemistry..... 187
City and Regional Planning..... 217
Civil Engineering..... 258
Computer Engineering..... 106
Computer Science..... 199
Construction Science and Management..... 8
Dairy Science..... 24
Economics..... 123
Education..... 1,325
  Administration and Supervision..... 489
  Counseling and Guidance Services..... 464
  Elementary Education..... 1,305
  Personnel Services..... 682
  Reading..... 424
  Secondary Education..... 312
  Special Education 118
Education Specialist..... 173
Electrical Engineering..... 408
Engineering..... 332
Engineering Mechanics..... 42
English 277
Entomology..... 150
Environmental Systems Engineering..... 254
Environmental Toxicology..... 5
Family Health Nursing..... 37
Fine Arts..... 83
Forest Resources..... 22
Forestry..... 138
History..... 59
Horticulture..... 143
Human Resources Development..... 18
Industrial Education..... 389
Industrial Engineering..... 51
Industrial Management..... 256
Management..... 152
Materials Engineering..... 14
Mathematical Sciences..... 368
Mathematics..... 170
Mechanical Engineering..... 336
Microbiology..... 130
Nuclear Science..... 3
Nursing..... 76
Nutrition..... 64
Nutritional Science..... 75
Parks, Recreation, and Tourism Management..... 50
Physics..... 150
Plant Pathology..... 47
Plant Physiology..... 2
Poultry Science..... 27
Recreation and Park Administration..... 119
Systems Engineering..... 42
Textile Chemistry..... 88
Textile Industrial Education..... 1
Textile Science..... 71
Textiles..... 1
Water Resources Engineering..... 52
Wildlife Biology..... 75
Zoology..... 166

Total Masters' Degrees Awarded..... 14,734

DOCTORS

Agricultural Economics..... 17
Agricultural Engineering..... 30
Agronomy..... 36
Animal Physiology..... 41
Applied Economics..... 39
Biochemistry..... 12
Bioengineering..... 22
Ceramic Engineering..... 5
Chemical Engineering..... 45
Chemical Physics..... 3
Chemistry..... 159
Civil Engineering..... 43
Computer Engineering..... 4
Computer Science..... 5
Electrical Engineering..... 59
Engineering Management..... 36
Engineering Mechanics..... 22
Entomology..... 76
Environmental Systems Engineering..... 39
Food Technology..... 6
Forest Resources..... 8
Forestry..... 11
Industrial Engineering..... 18
Industrial Management..... 36
Management Science..... 23
Materials Engineering..... 3
Mathematical Sciences..... 59
Mathematics..... 36
Mechanical Engineering..... 30
Microbiology..... 24
Nutrition..... 35
Parks, Recreation, and Tourism Management..... 8
Physics..... 99
Plant Pathology..... 23
Plant Physiology..... 41
Systems Engineering..... 8
Textile and Polymer Science..... 25
Vocational and Technical Education..... 35
Water Resources Engineering..... 1
Zoology..... 65

Total Doctors' Degrees Awarded..... 1,287

Grand Total Degrees Awarded 1896-1992..... 77,899

ENROLLMENT BY MAJORS AND ACADEMIC CLASSIFICATION
Fall Semester, 1992

Major Course	Freshmen	Sophomores	Juniors	Seniors	Unclassified Undergraduates	Total Undergraduates	First Time Graduates	Other Graduates	Unclassified Graduates	Total Graduates	Total All
College of Agricultural Sciences											
Agricultural and Applied Economics	0	0	0	0	0	0	4	9	0	13	13
Agricultural Economics	17	9	18	10	1	55	0	0	0	0	55
Agricultural Education	4	12	9	9	0	34	6	14	0	20	54
Agricultural Engineering	0	9	18	10	0	37	4	13	0	17	54
Agricultural Mechanization and Business	9	7	12	11	0	39	0	0	0	0	39
Agriculture	0	0	0	0	0	0	3	11	0	14	14
Agronomy	6	8	4	4	0	22	6	15	0	21	43
Animal, Dairy and Veterinary Sciences	0	3	2	3	0	8	0	0	0	0	8
Animal and Food Industries	0	0	0	0	1	1	6	12	0	18	19
Animal Physiology	0	0	0	0	0	0	4	13	0	17	17
Animal Science	77	43	22	28	1	171	0	0	0	0	171
Applied Economics	0	0	0	0	0	0	4	29	0	33	33
Aquaculture, Fisheries, and Wildlife Biology	41	39	32	33	0	145	9	19	0	28	173
Community and Rural Development	2	7	7	6	0	22	0	0	0	0	22
Entomology	2	3	4	1	0	10	7	22	0	29	39
Environmental Toxicology	0	0	0	0	1	1	11	24	0	35	36
Food Science	7	6	6	2	0	21	0	0	0	0	21
Food Technology	0	0	0	0	0	0	1	9	0	10	10
Horticulture	14	17	16	26	1	74	2	9	0	11	85
Horticulture - Ornamental	0	0	0	1	0	1	0	0	0	0	1
Horticulture - Turfgrass	2	9	12	11	0	34	0	0	0	0	34
Nutrition	0	0	0	0	0	0	3	18	0	21	21
Packaging Science	15	18	13	16	1	63	0	0	0	0	63
Plant Pathology	0	0	1	1	0	2	1	13	0	14	16
Plant Physiology	0	0	0	0	0	0	2	15	0	17	17
Poultry Science	2	2	3	3	1	11	0	0	0	0	11
Agriculture (Undeclared)	0	0	0	0	0	0	0	0	9	9	9
Agriculture (Undeclared)	56	6	3	0	0	65	0	0	0	0	65
Total	254	198	182	175	7	816	73	245	9	327	1,143
College of Architecture											
Architecture	0	0	0	0	10	10	25	54	0	79	89
Construction Science and Management	15	23	26	53	6	123	6	11	0	17	140
City and Regional Planning	0	0	0	0	0	0	19	41	0	60	60
Design (BA) Architecture Studies	36	21	18	16	0	91	0	0	0	0	91
Design (BS) Architecture Studies	63	41	46	84	2	236	0	0	0	0	236
Fine Arts	5	7	9	14	1	36	0	0	0	0	36
Landscape Architecture (BLA)	15	14	11	26	2	68	0	0	0	0	68
Visual Arts	0	0	0	0	0	0	4	14	0	18	18
Architecture (Undeclared)	0	0	0	0	0	0	0	0	3	3	3
Total	134	106	110	193	21	564	54	120	3	177	741

Major Course	Freshmen	Sophomores	Juniors	Seniors	Unclassified Undergraduates	Total Undergraduates	First Time Graduates	Other Graduates	Unclassified Graduates	Total Graduates	Total All
College of Commerce and Industry											
Accounting	126	124	147	117	4	518	26	25	0	51	569
Business Administration	0	0	0	0	5	5	146	302	0	448	453
Economics (BA)	3	8	14	17	0	42	0	0	0	0	42
Economics (BS)	12	13	36	33	0	94	24	33	0	57	151
Financial Management	75	117	171	168	4	535	0	0	0	0	535
Industrial Management	14	31	48	48	1	142	11	48	0	59	201
Management	126	108	182	217	3	636	0	0	0	0	636
Management Science	0	0	0	0	0	0	0	8	0	8	8
Marketing	105	102	126	139	1	473	0	0	0	0	473
Textile Chemistry	12	6	10	13	0	41	2	2	0	4	45
Textile Management	50	22	26	26	0	124	0	0	0	0	124
Textile and Polymer Science	0	0	0	0	0	0	2	13	0	15	15
Textile Science	0	0	2	1	1	4	7	3	0	10	14
Commerce and Industry (Undeclared)	0	0	0	0	0	0	0	0	13	13	13
Total	523	531	762	779	19	2,614	218	434	13	665	3,279
College of Education											
Administration and Supervision	0	0	0	0	0	0	8	78	0	86	86
Counseling and Guidance Services	0	0	0	0	1	1	68	190	0	258	259
Early Childhood Education	33	30	51	50	0	164	0	0	0	0	164
Elementary Education	99	137	131	156	3	526	14	71	0	85	611
Graphic Communications	39	36	53	47	0	175	0	0	0	0	175
Human Resource Development	0	0	0	0	0	0	34	65	0	99	99
Industrial Education	0	1	1	0	0	2	15	34	0	49	51
Human Resource Development	3	11	18	17	0	49	0	0	0	0	49
Industrial Technology	14	3	3	4	0	24	0	0	0	0	24
Vocational-Technical	0	0	2	2	1	5	0	0	0	0	5
Mathematics Teaching	6	8	18	35	1	68	0	0	0	0	68
Reading	0	0	0	0	0	0	9	25	0	34	34
Science Teaching											
Biological Sciences	12	13	14	14	1	54	0	0	0	0	54
Earth Science	0	3	3	4	0	10	0	0	0	0	10
Physical Sciences	3	4	4	4	0	15	0	0	0	0	15
Secondary Education	0	1	0	0	0	1	0	0	0	0	1
English	25	21	26	27	3	102	2	6	0	8	110
French	1	4	4	2	0	11	0	0	0	0	11
German	1	0	0	1	0	2	0	0	0	0	2
History	19	18	19	19	1	76	1	2	0	3	79
Mathematics	17	26	22	18	1	84	2	10	0	12	96
Natural Sciences	0	0	0	0	0	0	0	5	0	5	5
Political Science	2	0	3	3	0	8	0	0	0	0	8
Social Sciences	6	12	13	19	3	53	0	0	0	0	53
Spanish	4	5	3	3	1	16	0	0	0	0	16
Special Education	30	28	23	21	1	103	7	24	0	31	134
Vocational and Technical Education	0	0	0	0	0	0	1	40	0	41	41
Education (Undeclared)	0	0	0	0	0	0	0	0	787	787	787
Education (Undeclared)	10	0	35	11	18	74	0	0	0	0	74
Total	324	361	446	457	35	1,623	161	550	787	1,498	3,121

Major Course	Freshmen	Sophomores	Juniors	Seniors	Unclassified Undergraduates	Total Undergraduates	First Time Graduates	Other Graduates	Unclassified Graduates	Total Graduates	Total All
College of Engineering											
Bioengineering	0	0	0	0	0	0	14	50	0	64	64
Ceramic Engineering	0	21	55	73	2	151	3	29	0	32	183
Chemical Engineering	0	66	94	66	2	228	12	29	0	41	269
Civil Engineering	0	66	136	141	5	348	28	66	0	94	442
Computer Engineering	0	32	44	57	4	137	8	42	0	50	187
Electrical Engineering	0	48	119	173	9	349	36	131	0	167	516
Engineering Analysis	0	4	10	9	1	24	0	0	0	0	24
Engineering Mechanics	0	0	0	0	0	0	2	11	0	13	13
Environmental Systems Engineering	0	0	0	0	0	0	21	68	0	89	89
Freshman Engineering	910	422	105	4	3	1,444	0	0	0	0	1,444
Industrial Engineering	0	12	59	82	3	156	33	58	0	91	247
Materials Science and Engineering	0	0	0	0	0	0	5	7	0	12	12
Mechanical Engineering	0	81	190	210	12	493	45	80	0	125	618
Engineering (Undeclared)	0	0	0	0	0	0	0	0	20	20	20
Total	910	752	812	815	41	3,330	207	571	20	798	4,128
College of Forest and Recreation Resources											
Forest Products	2	0	2	2	0	6	0	0	0	0	6
Forest Resource Management	58	23	33	24	0	138	0	0	0	0	138
Forest Resources	0	0	0	0	4	4	18	34	0	52	56
Parks, Recreation, and Tourism Management	70	78	95	100	3	346	12	52	0	64	410
Forest and Recreation Resources (Undeclared)	0	0	0	0	0	0	0	0	4	4	4
Total	130	101	130	126	7	494	30	86	4	120	614
College of Liberal Arts											
Applied Psychology	0	0	0	0	0	0	10	15	0	25	25
Applied Sociology	0	0	0	0	0	0	6	13	0	19	19
English	42	53	88	79	2	264	24	62	0	86	350
French	2	2	2	1	1	8	0	0	0	0	8
German	0	1	1	0	0	2	0	0	0	0	2
History	38	43	40	44	4	169	11	22	0	33	202
Language and International Trade	40	51	62	67	0	220	0	0	0	0	220
Philosophy	3	2	0	1	0	6	0	0	0	0	6
Political Science	66	62	64	61	3	256	0	0	0	0	256
Professional Communication	0	0	0	0	0	0	5	2	0	7	7
Psychology	84	81	96	92	2	355	0	0	0	0	355
Sociology	18	23	43	50	2	136	0	0	0	0	136
Spanish	1	3	0	1	0	5	0	0	0	0	5
Liberal Arts (Undeclared)	0	0	0	0	0	0	0	0	16	16	16
Liberal Arts (Undeclared)	136	71	23	1	0	231	0	0	0	0	231
Total	430	392	419	397	14	1,652	56	114	16	186	1,838
College of Nursing											
Health Science	19	22	26	6	0	73	0	0	0	0	73
Nursing	164	121	152	130	19	586	9	71	0	80	666
Nursing (Undeclared)	0	0	0	0	0	0	0	0	6	6	6
Total	183	143	178	136	19	659	9	71	6	86	745

Major Course	Freshmen	Sophomores	Juniors	Seniors	Unclassified Undergraduates	Total Undergraduates	First Time Graduates	Other Graduates	Unclassified Graduates	Total Graduates	Total All
College of Sciences											
Biochemistry	19	27	25	18	0	89	4	10	0	14	103
Biological Sciences (BA)	19	13	17	14	0	63	0	0	0	0	63
Biological Sciences (BS)	112	82	77	78	3	352	0	0	0	0	352
Botany	0	0	0	0	0	0	0	1	0	1	1
Chemistry (BA)	2	2	1	3	0	8	0	0	0	0	8
Chemistry (BS)	20	11	14	8	0	53	14	49	0	63	116
Computer Information Systems	13	28	32	25	2	100	0	0	0	0	100
Computer Science (BA)	3	4	5	0	1	13	0	0	0	0	13
Computer Science (BS)	53	33	47	55	7	195	36	115	0	151	346
Genetics	0	0	0	0	0	0	1	5	0	6	6
Geology (BA)	2	2	0	1	0	5	0	0	0	0	5
Geology (BS)	4	2	5	5	0	16	5	5	0	10	26
Mathematical Sciences (BA)	5	4	4	2	0	15	0	0	0	0	15
Mathematical Sciences (BS)	11	20	29	31	1	92	26	78	0	104	196
Medical Technology	7	9	8	12	1	37	0	0	0	0	37
Microbiology	12	16	33	21	0	82	5	38	0	43	125
Physics (BA)	1	1	0	0	0	2	0	0	0	0	2
Physics (BS)	13	8	16	9	0	46	10	52	0	62	108
Prepharmacy	19	13	8	0	0	40	0	0	0	0	40
Prephysical Therapy	67	33	6	0	0	106	0	0	0	0	106
Preprofessional Health	65	17	5	0	0	87	0	0	0	0	87
Zoology	0	0	0	0	0	0	6	34	0	40	40
Sciences (Undeclared)	0	0	0	0	0	0	0	0	10	10	10
Total	447	325	332	282	15	1,401	107	387	10	504	1,905
Nondegree	0	0	0	0	150	150	0	0	0	0	150
International Student Exchange Program	2	0	0	0	0	2	0	0	0	0	2
Grand Total	3,337	2,909	3,371	3,360	328	13,305	915	2,578	868	4,361	17,666

ENROLLMENT BY STATE AND COUNTRY

Fall Semester, 1992

States

Alabama	31
Alaska	4
Arizona	2
Arkansas	4
California	28
Colorado	14
Connecticut	109
Delaware	57
District of Columbia	11
Florida	392
Georgia	626
Hawaii	2
Idaho	2
Illinois	50
Indiana	36
Iowa	3
Kansas	5
Kentucky	44
Louisiana	33
Maine	16
Maryland	344
Massachusetts	107
Michigan	35
Minnesota	13
Mississippi	22
Missouri	21
Nebraska	8
Nevada	1
New Hampshire	22
New Jersey	401
New Mexico	3
New York	231
North Carolina	392
North Dakota	1
Ohio	109
Oklahoma	11
Oregon	4
Other	669
Pennsylvania	227
Puerto Rico	3
Rhode Island	10
South Carolina	
Abbeville	95
Aiken	295
Allendale	16
Anderson	1,208
Bamberg	34
Barnwell	45
Beaufort	135
Berkeley	176
Calhoun	41
Charleston	551
Cherokee	127
Chester	51
Chesterfield	68
Clarendon	37
Colleton	67
Darlington	135
Dillon	57
Dorchester	204
Edgefield	50
Fairfield	44
Florence	230
Georgetown	72
Greenville	1,889
Greenwood	253
Hampton	48
Horry	239
Jasper	17
Kershaw	174
Lancaster	99
Laurens	212
Lee	37
Lexington	583
McCormick	23
Marion	68
Marlboro	30
Newberry	119
Oconee	699
Orangeburg	174
Other	695
Pickens	1,061
Richland	531
Saluda	52
Spartanburg	701
Sumter	184
Union	63
Williamsburg	61
York	364
South Carolina	12,116
Tennessee	123
Texas	60
Utah	1
Vermont	4
Virginia	381
Washington	11
West Virginia	38
Wisconsin	12
	16,847

Countries

Argentina	2
Australia	2
Bangladesh	4
Belgium	1
Belize	3
Bermuda	1
Bonia-Hercegovina	1
Brazil	4
Bulgaria	2
Burundi	1
Cameroon	1
Canada	13
Cayman Islands	1
China, Republic of	134
Colombia	6
Costa Rica	5
Croatia	1
Cyprus	1
Czechoslovakia	1
Dominican Republic	1
Ecuador	3
Egypt	6
El Salvador	2
Ethiopia	1
France	24
Germany	11
Ghana	2
Greece	2
Grenada	2
Guam	1
Guatemala	2
Haiti	1
Honduras	2
Hong Kong	2
India	390
Indonesia	9
Ireland	4
Israel	1
Jamaica	5
Japan	7
Jordan	4
Kenya	1
Korea, Republic	12
Lebanon	1
Malaysia	3
Mali	2
Mauritius	1
Mexico	7
Nepal	4
Netherlands	1
Netherlands Antilles	2
Nicaragua	1
Nigeria	2
Norway	4
Pakistan	11
Paraguay	2
Philippines	8
Poland	1
Romania	5
Russia	2
St. Vincent and Grenadines	1
Saudi Arabia	1
Singapore	4
South Africa	1
Sri Lanka	4
Sudan	1
Taiwan	46
Tanzania	1
Thailand	2
Togo	1
Turkey	8
United Kingdom	7
Venezuela	4
Yugoslavia	1
Zimbabwe	1
	819

Grand Total	17,666

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Course Abbreviations

A A H	Art and Architectural History
ACCT	Accounting
ADVSC	Animal, Dairy and Veterinary Science
AG E	Agricultural Engineering
AG ED	Agricultural Education
AG M	Agricultural Mechanization
AGRIC	Agriculture
AGRON	Agronomy
AN PH	Animal Physiology
ANTH	Anthropology
AP EC	Agricultural and Applied Economics
ART	Visual Arts
A S	Aerospace Studies
ASTR	Astronomy
BIOCH	Biochemistry
BIO E	Bioengineering
BIOL	Biology
BIOSC	Biological Sciences
BOT	Botany
CA AR	Architecture
CA DS	Interdisciplinary Studies
C E	Civil Engineering
C ED	Coaching Education
CH	Chemistry
CH E	Chemical Engineering
C LIT	Comparative Literature
COLED	College of Education
CP SC	Computer Science
CR AR	Ceramic Arts
C R D	Community and Rural Development
CR E	Ceramic Engineering
C R P	Planning Studies
CSM	Construction Science and Management
E C E	Electrical and Computer Engineering
ECON	Economics
ED	Education
E G	Engineering Graphics
E M	Engineering Mechanics
ENGL	English
ENGR	Engineering
EN SC	Environmental Science
ENT	Entomology
ENTOX	Environmental Toxicology
E S E	Environmental Systems Engineering
EX ST	Experimental Statistics
FD SC	Food Science
FD TH	Food Technology
FIN	Finance
FOR	Forest Resources
FR	French
G C	Graphic Communications
GEN	Genetics
GEOG	Geography
GEOL	Geology
GER	German
G S	Graduate Studies
H ADM	Hospital Administration
HIST	History
HLTH	Health
HORT	Horticulture
H R D	Human Resource Development
HUM	Humanities
I E	Industrial Engineering
IN ED	Industrial Education
I P M	Integrated Pest Management
ITAL	Italian
JAPN	Japanese
LARCH	Landscape Architecture
LATIN	Latin
LAW	Legal Studies
L&IT	Language and International Trade
LANG	Language
L S	Leisure Skills
MA SC	Management Science
MAT E	Materials Engineering
M B A	Business Administration
M E	Mechanical Engineering
MGT	Management
MICRO	Microbiology
MKT	Marketing
M S	Military Science
M T	Medical Technology
MTHSC	Mathematical Sciences
MUSIC	Music
NURS	Nursing
NUTR	Nutrition
PHIL	Philosophy
PH SC	Physical Science
PHYS	Physics
PKGSC	Packaging Science
PL PA	Plant Pathology
PL PH	Plant Physiology
PO SC	Political Science
PRTM	Parks, Recreation and Tourism Management
P S	Poultry Science
PSYCH	Psychology
REL	Religion
R S	Rural Sociology
RUSS	Russian
SOC	Sociology
SPAN	Spanish
SPCH	Speech
S T S	Science and Technology in Society
T C	Textile Chemistry
TEXT	Textile Management and Textile Science
THEA	Theatre
VT ED	Vocational and Technical Education
W F B	Wildlife and Fisheries Biology
W S	Women's Studies
ZOOL	Zoology

PURPOSE OF CATALOG

The purpose of this catalog is to give a general description of Clemson University and to provide prospective students with detailed information regarding the various colleges and departments within the University and curricula offered by the University. Inasmuch as the educational process necessitates change, the information and educational requirements in this catalog represent a flexible program which may be altered where such alterations are thought to be in the mutual interest of the University and its students.

The provisions of this catalog do not constitute a contract which may be accepted by students through registration and enrollment in the University. The University reserves the right to change without notice any fee, provision, offering or requirement in this catalog and to determine whether a student has satisfactorily met its requirements for admission or graduation. The University further reserves the right to require a student to withdraw from the University for cause at any time.

Each curriculum shall be governed by the requirements in effect on the date of enrollment. If a student withdraws from the University and subsequently returns or does not remain continuously enrolled (summers excluded), the requirements in effect at the time of return will normally prevail.

STUDENT RESPONSIBILITY

All colleges and departments establish certain academic requirements that must be met before a degree is granted. Advisers, department heads and deans are available to help the student understand and meet these requirements, but the student is responsible for fulfilling them. If, at the end of a student's course of study, the requirements for graduation have not been satisfied, the degree will not be granted. For this reason, it is important for students to acquaint themselves with all academic requirements throughout their college careers and to be responsible for completing all requirements within prescribed deadlines and time limits.

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